ELECTRICAL REVIEW

[ILLUSTRATED.]

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Expansion of Steam.

The results of a mathematical investigation of the limitations of the expansion of steam, by Prof. William Dennis Marks, of the University of Pennsylvania, can be epitomized as follows:

We cannot expect, under the most favorable circumstances, to reach an economy which will surpass but very slightly one pound of coal per indicated horse power per hour.

This would place eighteen per cent. of the heat in coal as the extreme limit of its utilization. The condensation of steam occurs during its admission to the cylinder, and in some cases is surprisingly great.

The law of this condensation is as follows:

The condensation of the steam in the cylinder is proportional to—

1. The difference of temperatures of the steam at the point of cut-off and while being exhausted.

2. To the area of cast-iron exposed to the entering steam up to the point of cut-off.

3. To the time of exposure of the interior surface of the steam cylinder to the exhaust steam.

4. The condensation is reduced by compression, subject to the same laws; but this is usually quite a small quantity.

The initial condensation of steam is due principally to the piston and cylinder heads.

The equilateral hyperbola approximates quite as closely as any other curve to the curve of expansion of steam in engines not embarrassed by a sluggish valve motion.

Compression will save some vaporous steam, but will not largely diminish the initial condensation because of its short duration.

Superheating is the most efficient expedient for economizing coal.

The steam jacket is not so efficient as is ordinarily assumed.

Slide valves are frequently the cause of large and unlocated losses.

The valves and pistons of steam engines are rarely steam-tight.

With properly designed compounded cylinders, the ultimate expansion of the steam is a function of the ratio of the two cylinders.

The saving in compound engines is due to lesser initial condensation in the non-condensing cylinder.

From the physical properties of iron arises the necessity and advantage of compound engines.

The beneficial effects of superheating, steam-jacketing and compounding are more apparent in small than large engines.

The most economic ratio of stroke to diameter for steam cylinders is a function of the number of expansions, of the boiler pressure, of the exhaust pressure, and of the number of strokes per minute.

A large cylinder is more economical than an equal volume divided among small cylinders.

High rotative speeds demand shorter cylinders than are ordinarily used.

It is frequently, especially with high boiler pressures, the more economical to not use a condenser.

The throttling of steam, with an engine of fixed expansion and small cylinder, does not increase the consumption of coal per indicated horse power per hour but very slightly.

The Rice Automatic Engine.

There has sprung up within the past ten years a marked demand for first-class engines of small powers, which has called out an entirely new type, shown by ample test, to be economical in the consumption of steam, closely regulated, and whose compactness of frame and simplicity of parts admit of high speeds and inexpensive foundations. The inventor has been compelled to keep constantly in view a low competing price of the cheaper class and the efficiency developed by those of the higher order. In not every instance has these efforts been even measurably successful. A notable exception appears in the engine here represented, which, upon examination, soon establishes itself as a splendid specimen of this class. In addition to its high rated economy and smooth working qualities, the inventor seems to have ably provided for a large number of prevailing ills, and petty annoyances which are often found in high speed engines. Mr. Rice has provided this engine with stationary oilers throughout, something every engineer will appreciate. This enables the engine to be run days and even weeks with no attendance save the occasional filling of the oilers By a most ingenious device the oiling of the crank-pin is so arranged as to prevent effectually the throwing of oil. The governor is so placed within and at the back of the crank-plate as to be thoroughly protected from any object which might impair its usefulness. Its action is by means of levers through the hollow crank-pin to the eccentric, and forms one of the simplest and neatest arrangements possible. The valve is a single one with double parts, so perfectly balanced as to admit of its being moved by hand when under full head of steam. Another important feature is its self-contained principle which enables the engine to do good service, even on an illy constructed and imperfect foundation. The manufacturers claim to save one-third the cost of foundations over engines having an outside bearing. In these days, where the cost of every little detail is carefully counted, it is not difficult to realize the importance of this, since there is not only a saving in the material and cost of building expensive foundations, but in the services of expert assistance in placing the engine in position.

One of these engines was in daily service at the recent Minneapolis Exposition, and received high praise from the company whose electric lights it ran, as well as attracting a wide-spread attention. The fact that the Edison lights require an evenness of motion, and that this was the only engine which ran throughout the exhibition without stopping its lights, emphasizes the good record it made for itself. It seems especially adapted to fine work and long steady runs, which are gaining for it a decided reputation. Although it has the elements of simplicity of form, and apparently is of easy description, the inventor, Mr. Rice, states that it is somewhat difficult to describe it in a satisfactory manner, and that its real beauty and charm is only fully revealed when it is seen running.

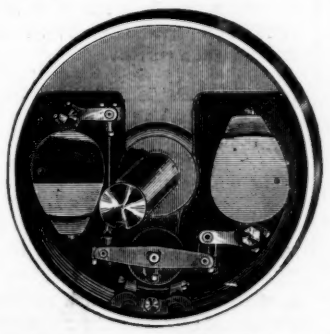


FIG. 2.—INTERIOR VIEW OF GOVERNOR.

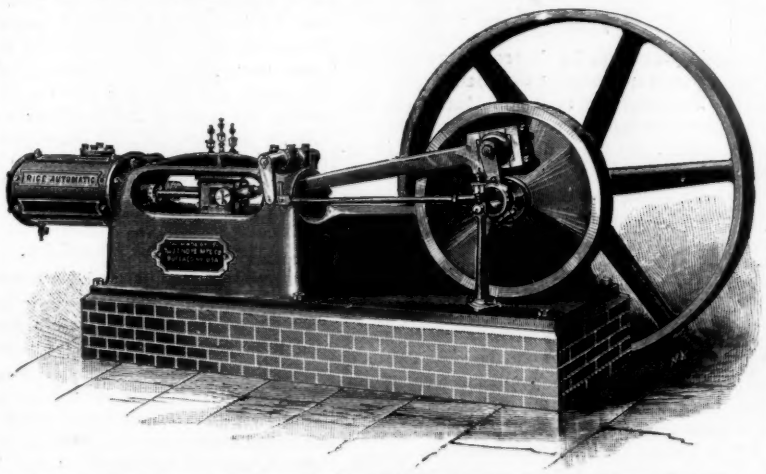


FIG. 1.—THE RICE AUTOMATIC ENGINE, MANUFACTURED BY THE JOHN T. NOYE MANF'G. CO, BUFFALO.

The John T. Noye Manufacturing Company, of Buffalo, N. Y., have acquired the exclusive right to manufacture this engine, and have equipped their already complete mill furnishing establishment for the purpose of turning them out in any desired size and quantity. They are built of varying horse power, from 10 to 300, a full stock of these and intervening sizes being kept in stock for immediate shipment.

Any communications addressed to this company, whether from interest in the detailed construction of this model engine or with a view to a purchase, will receive prompt attention.

At the recent Electric Light Convention in Philadelphia, Mr. Rice was present, and met a number of the owners of electric light stations, who took quite an interest in the description he gave of this engine.

Electromotive Force of the Electric Spark.

BY E. EDLUND.

A statical plate machine was connected up to a galvanometer provided with a shunt of suitable resistance, and parallel with the shunted galvanometer was arranged another shunt circuit comprising a vessel which could be exhausted of air, and into which projected two wires terminating in ball electrodes. When the plate machine was worked at a certain speed, and the last-named circuit was open, the galvanometer showed a deflection of 1 or 1½ divisions; but if the shunt circuit was closed so that the current from the plate machine divided itself between the vacuous space, the galvanometer shunt, and the galvanometer itself, instead of the deflection being diminished, it increased to 50 divisions.

This can only be explained by the supposition that there exists in the electric spark an E.M.F. which sends a current in the opposite direction to that from the plate machine. Experimenting with tubes provided, one with brass electrodes and the other with aluminum electrodes, it was found that the deflection of the galvanometer varied with the pressure in the tubes, and that it was a minimum at 6 mm. pressure for the brass electrodes, and between 30 and 70 mm. for the aluminum.

An induction coil was tried instead of a plate machine, with similar results. The difference of strength of the currents which prevails for various pressures depends on the modifications of the E.M.F. of the spark, and cannot be explained by alterations of resistance alone.

In order to see which electrode, the positive or the negative, was the seat of this E.M.F., a tube was arranged in form of a **Y**, with an electrode at the end of each branch; the tube could be put in communication with an air-pump. Calling the left-hand top electrode *A*, the bottom one *B*, and the right top one *C*, the distance of *A* from *B* was greater than that of *C* from *B*. A battery was connected up between *A* and *B*, and a shunted galvanometer and a resistance of 28,000 ohms between *C* and *B*. If *B* is made the positive pole, there will be an opposing similar force at *C*, and it is the difference of the two forces which will produce a current through the galvanometer. If *B* is the negative electrode, the current is in the opposite direction.

If b is the force at *B*, and c at *C*, then, if the strength of the current decreases when the rarefaction increases, b must decrease more rapidly than $b-c$, and conversely. Consequently the force b rises and falls through wider limits than the difference $b-c$. With a pressure of 23.2 mm. when *B* was positive, there was a deflection of 3.3 divisions; when *B* was negative, 1.3 division. With a pressure of 0.023 mm. when *B* was positive, there was a deflection of 1.8 divisions; when negative, 20.2 divisions; the E.M.F. in both cases was acting in opposite direction to the charge. On charging, an opposed electromotive force is produced both on the positive and on the negative electrode; that on the positive plate decreases with in-

crease of rarefaction, that on the negative increases.

The early experiments were made with aluminum electrodes, but these were afterwards replaced by other metals, when it was found that the E.M.F. depended on the nature of the electrode as well as on its size and form.

At every charge two induced currents were set up in the galvanometer coils, but these nullified each other by passing through the shunt, and were without effect on the results.

The effect of magnetism was very marked on the pole C; it increases the deflection when the pressure is less than 0.54 mm., and decreases it for higher pressures. The effect on the electrode B is the opposite; for pressures less than 0.041 it diminishes the current. If the magnet was at an intermediate position betweeen B and C, it always diminished the current.

The experiments also explain the fact that in the case of an arc lamp under ordinary atmospheric pressure the positive carbon is hotter than the negative, while in rarefied air the reverse is the case. In the former case the positive carbon is the seat of the highest E.M.F., in the latter the negative.

Mr. Cahill's Opinion of the Electric Light.

Dr. Michael Cahill filed an affidavit with the County Clerk, in San Francisco, setting forth that the electric light is God Almighty and entitled to more reverence than to be hired out to light up public highways, gin-mills, dives, theaters, or to run sewing machines, railroad cars and to heat cooking stoves. In support of his theory he quotes several Scriptural passages, and winds up with the following: "Governments being God's ministers, it is the duty of the State and the United States Governments to stop this outrage on creation within its limits, and see that 'God' is no longer compelled to light streets, run cars, etc."

Mr. Cahill was well dressed and very quiet, and paid fifty cents for filing his affidavit. He wanted to know if the Supervisors would notice his affidavit, and said he was going before the Grand Jury to have everybody that was using the electric light in an improper manner indicted. Dr. Cahill has been to Washington three times, and has presented similar affidavits to Congress.

Electrical Phenomena.

At one time it was very hard for me to believe, indeed, that any person living possesses such a power as being able to shuffle across the carpet of a room, and light the gas as it issued from the jet of the burner, by simply touching it with the tip of the finger. I have at present, however, two friends, at least, among my acquaintances, who seem to be capable of performing this feat at all times, and under any circumstances. Now, I find similar phenomena exhibited to a very high degree in my own person, at Fort Wingate, New Mexico. This point is over 6,000 feet above sea level; the only water in the neighborhood is a small pond—a puddle really—and a few insignificant springs. The air is usually clear, and highly rarefied; indeed, all the conditions seem to be favorable to the exhibition of electrical appliances.

Only the other day, while pacing my room, passing, as I did so, each time, over a large wooden Navajo blanket that lay spread out on the floor, a circumstance arose which called upon me to touch the cast-iron urn that ornamented the top of a small wood stove in the apartment and which had a fire in it at the time. Before the tip of my index finger touched it, by a distance of fully a centimetre, there was displayed in the intervening space a brilliant electric flash, accompanied by a report that could be distinctly heard in the adjoining room above ordinary conversation. The experiment was repeated three or four times, but the display became more and more feeble with each trial; it regained its original force, however, after I paced across the blanket on the floor a few times. Additional experimentation went to show that this electrical discharge was considerably greater from the tip of the index finger than from any of the others of the hand, gradually diminishing in regular order as we proceeded to the little finger; and, further, it seemed in my case, more evident in the left index rather than in the right one. When all ten finger tips were drawn together and then brought up to within a centimeter's distance of the stove urn, the flash and report appeared no greater than it did from the index finger alone.—*Science.*

Self-Induction.

By Eric Gérard.

Variable currents play a great part nowadays in quick working telegraph instruments, in telephones, in alternate current machines, etc.; and in all cases where we have variable currents, we have also induced currents either in the same wire or in neighboring wires. Where induction takes place between two wires, it may be expressed by the equation

$$M = 2l\left(l \cdot \frac{2\,l}{h} - 1\right),$$

l being the length for which the wires are parallel, and h their distance apart. In the case of self-induction, if E is the E.M.F. in the circuit, R the resistance, L the coefficient of self-induction, ε the base of the natural logarithms, i the strength of the current, t the time since the closing of the circuit, then

$$i = \frac{E}{R}\left(1 - \varepsilon^{-\frac{R}{L}t}\right),$$

and as $\frac{R}{L}$ is generally a large number, if t becomes of some value, the equation becomes practically that of Ohm.

If now the E.M.F., instead of being constant, as supposed in the preceding case, varies according to a given law, then we obtain a more complicated expression. In the case where the circuit has a coefficient of self induction L, a resistance R, and the E.M.F has a periodic time T, we obtain for each moment a current

$$i = \frac{E_o}{\sqrt{R^2 + \frac{4\,\pi^2\,L^2}{T^2}}}\, sin\left(\frac{2\,\pi\,t}{T^2} - \phi\right)$$

ϕ being given from

$$t\,g\,2\,\pi\,\phi = \frac{2\,\pi\,L}{T}$$

The phenomenon of self-induction has the effect of producing a retardation in the undulations of the current, and of diminishing its strength, as if the resistance had increased in the ratio of R to

$$\sqrt{R^2 + \frac{4\,\pi^2\,L^2}{T^2}}$$

this quantity under the root representing the apparent resistance of the circuit.

Self-induction in the bobbins of the telephonic translators considerably weakens the current, but the self-induction is itself diminished by the mutual induction of the neighboring bobbins; or, as it is sometimes stated, the mutual induction diminishes the apparent resistance.

Not only may self-induction occur in the case where the current follows a spiral path, as in a bobbin, but it may also arise in straight wires. For the rectilineal current in a straight conductor may be looked upon as made up of several parallel elementary currents which react on each other so as to give rise to an E.M.F. of induction opposed to that which produces the current.

The formula for the induction of parallel currents has been already given, and in the case of a single wire of radius r, in which the mean distance of the several elementary currents is $h = 0.07788\,r$, the coefficient of self-induction becomes

$$L = 2\,l\left(l.\frac{2\,l}{r} - 0.75\right).$$

This is in the case of non-magnetic wires; but for wires of magnetic metals the induction is more powerful, for each time that a current is started in the wire the external layers are magnetized. The coefficient of self-induction has therefore to be increased by a quantity depending upon the magnetization, and becomes

$$L = 2\,l\left(l.\frac{2\,l}{r} - 0.75 + K\right).$$

The author has carried out some experiments on the general plan of Professor Hughes, but with some differences in the arrangement of the apparatus; his results confirm the calculations given above.

Conductors of square section have less self-induction than those of circular section because the elementary currents have a greater mean distance in the former case. The use of ribbon conductors for lightning-rods does not, therefore, depend on their greater surface-conductivity, as used to be supposed, but on their lower self-induction.

In the case of compound wire, *i. e.*, a steel core, electro-plated with copper, part of the current passes through the steel core, and part through the copper covering. These two parallel currents mangnetize the exterior layers of the core in opposite ways, and consequently the self-induction is less. If the copper were inside and the steel outside, the opposite effect would be produced.

Useful Hints for Steam Users.

The facts will be found of use for ready reference in calculating the amount of fuel used, saved or wasted by an engine or boiler in the usual working year of 300 days of ten hours each, and also in a working year of 300 days of twenty-four hours each, such as is the customary run of establishments working 144 hours per week. Each pound of coal per hour per horse power amounts in 300 ten-hour days to 1.33928 gross tons of 2,240 pounds each, and in 300 twenty-four-hour days to 3.21428 gross tons. Each half pound of coal per hour per horse power is 0.66964 gross ton per year of 300 twenty-four-hour days. Each quarter pound of coal per horse power is 0.23482 gross ton per year of 300 ten-hour days, or 0.80357 gross ton per 300 twenty-four-hour days. Each eighth pound of coal per hour per horse power is 0.16741 gross ton per year of 300 twenty-four-hour days. The gross ton of 2,240 pounds avoirdupois is given in these calculations.

To reduce gross tons of 2,240 pounds to net tons of 2,000 pounds, multiply by 1.12 or divide by 0.8928, whichever is more convenient, and conversely. To reduce net tons of 2,000 pounds to gross or legal tons of 2,240 pounds, divide by 1.12, or multiply by 0.8928, according to convenience. In the application of the foregoing figures, suppose a condensing steam engine to develop 175 horse power with 40 pounds initial pressure above atmosphere, with a coal consumption of 3¾ pounds per hour per horse power, and that by increasing the initial pressure to 50 pounds by the gauge, the work was 185 horse power, with a coal consumption of 2¾ pounds per hour per horse power, the saving per year of 300 ten-hour days is 0.66964 gross ton for each horse power, or 0.66964×185=126.2834 gross tons, and the saving per year of 300 twenty-four-hour days is 160,714 by 185=297.32 gross tons.

Grinding Out Electricity.

The utilization of prison labor as a motive force in connection with the electric light has been much talked about of late, in England, and it is generally admitted by political economists there that criminals might be better employed than in "grinding the wind." A great deal of power which could be turned to excellent account is undoubtedly wasted, and the use of the "crank" as a mere punishment in many London jails has often been condemned. The main objection to prison labor as a motive force seems to be that it is intermittent in character. But, then, it is urged that relays of prisoners might be arranged for and a continuous supply of force secured. There are three "shifts" in twenty-four hours in many collieries, and always two; there are three "watches" on board ship, and the advocates of the system contend that some such plan might be brought into operation with a view to secure a continuous motive power for the production of electricity and many other purposes.

* * A new electric railway signal has been invented by Dr. E. D. Wells. The invention divides the line, as in the block system, with electrical connections, by which a train is automatically signaled by the ringing of a bell in the engine, as well as by a danger signal, and prevented from entering upon a section of track until it is cleared. It is also applied to switches, so that if a switch is left open the engineer is informed of the fact by the automatic ringing of the bell in his engine.

Modern Torpedo Boats.

The most noted torpedo boat builders of the world are Messrs. Yarrow and Messrs. Thornycroft, of London. Each of these great firms employs from 1,000 to 1,200 workmen, and can turn out at least one completed boat per week. The chief peculiarity of torpedo boats is their almost phenomenal speed. They are built of steel, the different classes ranging in length from 55 feet, intended for harbor defense, to vessels of 166 feet, capable of making an extended cruise at sea.

The Falke, a boat recently built by the Messrs. Yarrow for the Austro-Hungarian Government, is 135 feet long, 14 feet wide, draught of water 5 feet 6 inches, and attained on the trial trip a speed of 25½ miles per hour. The armament consists of two Nordenfeldt machine-guns, carried on deck, and two bow-tubes for discharging Whitehead torpedoes.

The development of torpedo boats is now so rapidly progressing that any description becomes almost out of date during the writing. A vessel just completed by the Messrs. Yarrow for the Japanese Government is the largest that has been yet built. It is 166 feet long, 19 feet wide, is provided with twin screws, to give greater facility in turning, and maintains a speed of 24 miles per hour. The engines are protected by a steel deck one inch thick; and, in addition to two bow-tubes for discharging torpedoes directly ahead, two turn-tables are mounted on deck, from which torpedoes can be launched in any desired direction.

Very similar in their construction, and no less famous for speed and maneuvering qualities, are the boats built by the Messrs. Thornycroft.

In this country, the Messrs. Herreshoff, of Bristol, R. I., have built a number of very fast boats, designed to be used with torpedoes. One of these is the noted steam yacht Stiletto, which may well be taken as a representative of the American type. The Stiletto is built of wood, with iron braces; length, 94 feet; width, 11 feet; draught of water, 4 feet 6 inches, and has attained a speed of 25 miles per hour.

A very formidable torpedo vessel has been built in recent years by that greatest of living engineers, Captain John Ericsson. It has been appropriately named the Destroyer. Once, at a critical moment in the history of our country, as every American well knows, Captain Ericsson came to the rescue with a Monitor. Since then his genius, energies, and mechanical skill have been devoted to the problem of saving our great coast cities from destruction in the event of war with a foreign naval power. The result of these years of study and experimenting is the Destroyer, armed with a torpedo gun which discharges under the water a projectile carrying a charge sufficient to sink the largest iron-clad afloat. The submarine gun is mounted in the bow of the vessel, near the keel, and is thus nearly ten feet below the surface of the water. It consists of a cylinder of gun metal, or steel, 30 feet long, additionally strengthened at the breech by broad steel rings. It is loaded at the breech, the muzzle being encased by the vessel's stem, and closed by a valve to exclude the water. This valve is opened by suitable levers just before the gun is to be discharged, and closes automatically as the projectile leaves the muzzle. The projectile is a steel torpedo, 25 feet long, 16 inches in diameter, and carrying a charge of 300 pounds of gun-cotton. It has a range of 300 feet during the first three seconds of its flight. The form of the torpedo is cylindrical, with a conical point in which is placed the percussion-lock and firing-pin, and the explosion takes place upon impact.—*From "Modern Aggressive Torpedoes," by Lieut. W. S. Hughes, in Scribner's Magazine for April.*

* * A fine meteor was seen by several Philadelphians on last Monday just after midnight. It was described as being about half the size of the full moon when at its height, as clear as an electric light, and with a train, which shaded from a light pink at the head to a purple at the end. There were numerous sparks similar to those which would fall from a Roman candle.

The Employment of Spiral Springs for Measuring Instruments.

In a paper by Professor W. Kohlrausch, in the *Electrotechnische Zeitschrift*, on the employment of spiral springs for measuring instruments and the accuracy of galvanometers constructed therewith, the causes which are likely to affect the constancy of spiral springs are mentioned in detail by the author, with an account of experiments bearing on each point, in order to afford some idea of the reliance that can be placed on the indications of instruments into the construction of which they enter. The effect of age, judging by observations on a brass spring extending over a period of seven years, may be completely neglected. Continuous and prolonged deformation produces a small amount of permanent set, so that the spring, when released, does not return to the original position, but does not actually alter the indications of the instrument, if the readings are taken from the new zero thus found; steel is in this case less affected than German silver. Oft-repeated, but intermittent deformation—as exhibited by a spring of 90 convolutions and 2½in. long being stretched so as to change from a length of 3½in. to 9in., two hundred times per minute for four hundred minutes—introduced no appreciable alteration in its subsequent indications. An increase of temperature of 18° Fahrenheit raised the indications of a Siemens torsion galvanometer about $\frac{1}{10}$ per cent., so that the reduction in the elasticity of the spring is apparently almost equal to the decrease in the moment of the magnet, which would be, under these conditions, about 0.4 per cent. Further experiments on loaded springs confirmed this conclusion, and showed that steel was again to be preferred to German silver. By combining the results given above, the utmost limit of error introduced by the use of spiral springs cannot exceed 0.5 per cent. If, however, as is the case in the Siemens tension-galvanometer, the current passes through the spiral spring, care must be taken that the heating from the passage of the current is not excessive. The author found an alteration of 1.4 per cent. in the indication of such an instrument after 30 minutes' continuous test, with a difference of potential of 100 volts between the terminals. If such instruments be calibrated at intervals, to correct the decrease in the moment of the magnet, an accuracy within about 0.1 per cent. can be relied on. With the Siemens dynamometer for intense currents, the limit of error, owing to the friction at the mercury contacts, is about 1 per cent. Another form of instrument, the spring galvanometer of F. Kohlrausch, is also reliable within 1 per cent., and is perfectly aperiodic with frictionless damping. Owing, however, to the employment of an iron core, the readings of currents taken in ascending and descending order of magnitudes will vary to some considerable percentage from the effect of residual magnetism, which exists in even the best soft iron, if this error be not eliminated by mechanically bringing the core past the position it would take up under the action of the current, and then leaving it free to return to that position.

An Electric Light Man's Experience.

Owen O'Neill, an electrician, was sent Monday afternoon to repair an electric light wire, said to be "short circuited," at the corner of Randolph and Dearborn streets, Chicago, connected with the plant in the rear of the Grand Opera House. He got his left hand in contact with the wire and had an experience he will not soon forget. "I have had many close calls, but this is the closest of them all," he said to a reporter. "Once, when I was a brakeman on the Illinois Central, I was thrown pretty nearly 100 feet from a wrecked train. Another time I was closely pinched between the 'bumpers' of two freight cars. Only about a year ago I had a very narrow escape from death by an electric shock. I was 'switching' a wire when the handle of my hammer broke and my hand struck the charged wire. Fortunately, when I fell the weight of my body broke the connection or I would have been killed. I believe I have a charmed life. This last time I was told that the wires were 'dead,' and, of course, I had no fear in handling them. There was a place, close to the end of the conduit, where two wires touched. I suppose this was the seat of the trouble. Holding a burning candle in my right hand I reached up to separate the two wires, when I felt the current strike me. The wires are supposed to be insulated, and this was a heavy half-inch cable, but by some means or another the insulation was not perfect. I felt a tingling sensation pass through my body. I attempted to rescue my left hand with my right, but the latter seemed paralyzed for the time being. I then began to move up and down like a 'jumping jack,' and to jerk about like a person affected with St. Vitus' dance. Finally I was thrown several feet away from the wires and lay there unconscious. A sensation like a dream came over me. I thought a great crowd of people were trying to get me out of some predicament, but they could not succeed, and I was utterly helpless to assist myself. What the predicament was or how I got there I did not know. When I partially returned to consciousness they say that the first thing that I asked was: 'Who frew dat brick?' I don't remember asking that, but I know I asked where I was, for I hadn't the least idea of my surroundings. I remember, though, of them calling a wagon and taking me home."

One of Mr. O'Neill's fingers is so badly burned that it will probably have to be amputated, and two others are very seriously hurt.

Questions from an Electric Light Man.

To the Editor of Electrical Review:

You say that you will send any book desired on electrical subjects. I desire a small, plain, concise treatise on the establishment and maintaining of an arc system—a sort of hand-book. Most of us who own and run plants have less interest in the new inventions, which threaten to ruin us by their improvements, than we have in discussions which promise to aid and assist us in making our present investments pay.

Could you not give us a corner in your REVIEW where we could weekly find something in the practical every-day business?

For instance, most of us have the No. 6 underwriters' wire; I refer now to those who put in plants two or three years ago.

The insulation on this wire was good enough when we bought it, but now we are advised to throw it away and put in some of the new styles. The wire itself is just as good to-day as ever. Is there not some way by which we could paint it or soak it in some insulating compound, and thus prolong its life and increase its safety?

Why could it not be rewound or rebraided? Another query. What is the best way to put an arc wire through a brick wall? Thus far I have used soft rubber pipe or tubing, but I now think that hard rubber tube would be better.

PLINY NORCROSS.

Janesville, Wis., March 17, 1887.

Paris Electrical Notes.

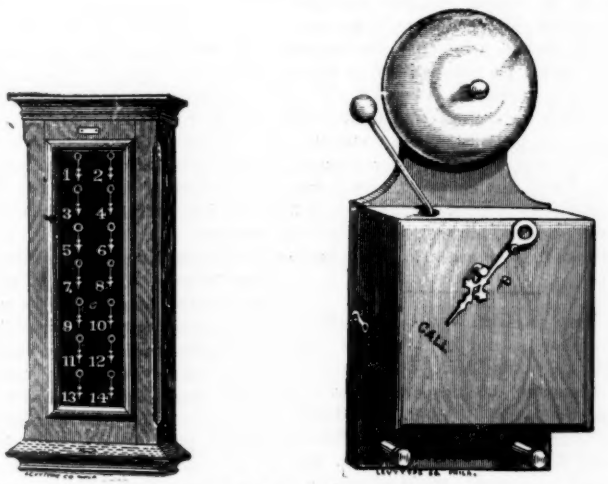
The celebrated works of the Maison Creil are now lighted with ninety arc lamps, of the Gramme and Breguet types, and the offices are lighted with one hundred 15 candle power glow lamps. The installation has been fitted up by Messrs. Sauter & Lemonnier, and the dynamos employed are of the Gramme type.

Messrs. Rothschild, of Paris, have formed a new company, called "La Société pour le Travail Electrique des Metaux," which has bought up all the patents connected with electric welding, and other applications for the working of metals by electricity. The capital is fixed at £12,000.

The local Edison Company are elaborating a scheme for the erection of a central station for the distribution of electricity by induction coils, the transformers employed being those of the Zipernowsky pattern, for which the company hold a license in France.

The Compagnie Electrique is now preparing some experiments, which will be publicly shown in about five weeks' time. The object is to give a demonstration that the transmission of power electrically is easy and economical. At the generating station there will be employed four dynamos, placed in series, producing a total of 8,000 volts, and the power will be obtained from four motors, also placed in series; whilst the circuit between the groups of generators and motors will represent a line of 100 ohms resistance.

—— Walkerville, Montana, is now lighted by electricity. In and around the Alice Mills ten arc lights are to be placed.



FIGS. 1 AND 2.—NEW NEEDLE ANNUNCIATOR OF PARTRICK & CARTER.

New Electrical Apparatus of Partrick & Carter, Philadelphia.

Under a recent patent (Feburary 16, 1887) Messrs. Partrick & Carter, of Philadelphia, are manufacturing their needle annunciators, shown in Fig. 1 on this page. With this improved attachment the manufacturers state that it is impossible to get false indications by the jarring of cars in turning sharp curves, etc., nor in steamships where vessels are liable to rock. With lock attachment the annunciator can turn a complete circle without the needles showing any indication, and when circuit is made the needle will fly into position and remain there until thrown down by a mechanical appliance moved by hand. Their car and steamship annunciators are in use by some of the most important railroads of the United States and Canada; also by a large number of steamers.

This company is now making needle indicating attachments for their box bells. The uses of this application of the patent needle annunciator to box bells are too numerous to mention. The instant circuit is closed the bell will ring, and, at the same time, needle will indicate; so that if attendants are not present when the bell rings they will at once see that they are required. If by any possible means the bell should get out of adjustment and fail to ring, the needle will indicate, and thus show that a call has been made. The needle is thrown off by hand and is at once ready for next call. This attachment is made to any of the regular box bells.

Electric Lighting in New Orleans.

The New Orleans City Council has become round shouldered on the electric light question, at last, and risen in its might. Those who have looked into the electric wire matter down there tell us that almost anywhere in the town there is a prevalence of moisture which sometimes fairly drips from the walls, where it condenses from the atmosphere. As one expert remarked, "there is very little moisture in the baker's ovens, and a few of that sort of places, but the town is as sweaty as a bath room, and a beastly bad place to run wires satisfactorily."

So the council issued a manifesto, consisting of sixteen sections, officered, as it were, by several whereases, as follows:

Whereas, The injury to the banquettes, the obstruction to sidewalks and streets by telegraph and electric wire posts, has become so great as to require some new plan for running the electric wires through and about the city; and,

Whereas, The posts and supports for electric wires, as now placed upon the streets and other public places, obstruct the streets, banquettes or sidewalks, are an injury to the streets and have become a nuisance; and

Whereas, The great number of electric wires, now run upon said posts are too near the houses, and tend greatly to impede the extinguishment of fires; and

Whereas, The whole system now in vogue of running electric wires through the streets, is primitive, injurious to the public safety and dangerous to life, and said wires should be elevated above the neighboring houses, now therefore.

The ordinance grants to Maurice J. Hart and his successors, for the term of fifty years, the sole right to erect towers and swing cables for electric lighting, telegraph, telephone and other electric purposes. They are to be of Star Iron work, ornamental as possible, located at the corners of street crossings on four legs; no wire to be less than ten feet from roofs of adjoining buildings, save where the lines run over neutral ground. The said Hart and his heirs have the right to remove all obstructions in the way of signs, awnings and posts. The rental price allowed the company is fixed at not more than $500 per mile for a "horizontal section or division of three by five feet upon every tower and support within said mile, for occupation by not more wires or cables than shall, together, be of the weight of one hundred number ten wires, American measurement (say Brown & Sharpe's) and no person shall claim or demand any right to have a less price for a smaller space or less weight."

And everybody's electric wire must go on the towers, and nobody must use the towers for clothes line purposes or as hitching posts, except by permission. The city is to have stand pipes on the towers, and the free use of all space necessary for its fire and police wires.

The contract for these towers with the Star Iron Tower Company, of Fort Wayne, will call for something over two hundred of these structures.

Work is to be commenced within six months.

Electric Light in Brussels.

The Commune of Pepuister, near Liege, is going to adopt the electric light. The conditions are similar to those of the lighting of Contisch. Several large electrical companies have been asked to tender.

The Société Industriel d'Electricité, of Brussels, have conceded to Mr. Deatz, of Antwerp, the contract for lighting the Courtrai Railway Station, for which he is to be paid either a lump sum or an annual rent of £1,600. The contractor hopes to extend the lighting from the station to neighboring buildings.

The new mixed system of lighting at the Cafe Victoria has proved very successful. The incandescent lamps are grouped on electroliers, and, in some rooms, alternate with Bower gas lamps. The light is very steady.

Large quantities of accumulators on Gadot's and other systems, says *Industries*, are sold in Brussels for new lighting projects in various parts of the town.

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EDITORIAL ANNOUNCEMENT.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Frank M. Gilley, 54 Equitable Building, Boston, Mass., is our New England representative.

Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill., will represent the REVIEW in the West

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NEW YORK, APRIL 2, 1887.

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San Francisco is the parent of an Aerial Navigation Company. The motive power adopted for this method of travel is steam.

Wisconsin has a Legislature after the fashionable make up. The Senate the other day concurred in the bill requiring short line telegraph companies to pay a State tax of one per cent. on gross earnings, and compelling a rate of 25 cents for 25 words.

The aerial wires still seem a source of much annoyance to several legislatures. There is an evident desire to bury them, and judging from some of the bills introduced for cutting down rentals, all profits are to meet a similar fate. It is to be hoped that a little commercial as well as electrical wisdom will prevail.

There is some excellent advice in a communication relating to overhead wires, by Mr. Tillinghast, of Buffalo, published on another page. The aerial wire problem is largely solved when from 50 to 100 wires are bunched in a cable which occupies no more space on a cross arm than one wire would.

Mr. J. A. Powers and Mr. F. A. Cheney, of Troy, N. Y., are the inventors of a new method of transmitting and dividing the electric current. Patents have been issued and their first experiment in commercial lighting by this method will be made at Troy. These gentlemen are educated and progressive electric light workers, and the result of their labors will be awaited with interest.

Mr. H. M. Linnell, business manager of the Schuyler Electric Light Company, of Hartford, for two years past, has resigned, and will devote his time chiefly to electric lighting, as a contractor and expert. During Mr. Linnell's connection with the Schuyler Company he installed a large number of plants, and was a strong factor in pushing the business of that company. He is one of the bright and enterprising young men in the electrical business, and will, we predict, win full success in the broad field he has decided to enter.

We have received, with the compliments of the author, a copy of "Dutton's Analytical Book-keeping Chart," published by the *Office* Company, of this city. Mr. Chas. Dutton, the talented author, is well known in telephone circles as auditor of the Southern Bell and East Tennessee companies, and is an expert accountant, president of the Bureau of Audit of New York. The work contains a chart headed, "A Topical Outline of the Principles to which all the Transactions of Business can be Reduced," which gives a graphic analysis of book-keeping and business. There are forty pages of text, full of most valuable and expert information for every accountant. The volume is sold for $1, and will undoubtedly meet with a large sale.

A "British Electrical Association" is now proposed by the London *Electrical Review*, which calls attention to those successful organizations, the National Electric Light Association and the Electric Club, of this country. The *Review* says:

"Patent office reform, standard gauges, uses for electric motors, legislation as affecting the electrical community, the commercial position of the telephone, are all subjects which afford scope for discussion, and upon which the interchange of experience and ideas would be particularly valuable. There would, of course, be the danger of individuals seeking self-advertisement and of trade jealousies arising; but the Americans have found an effectual mode of suppressing the former, which might be as easily adopted here, and it is an insult to British common sense to urge the latter objection as a reason why questions of general interest should not be considered with the view to mutual benefit. Britons, bestir yourselves, and justify your claim to a foremost position amongst the peoples of the earth as a nation of practical men!"

THE DEATH BY FIRE OF ROBT. S. BOYD.

The very sad news is confirmed of the death of Mr. Robt. S. Boyd in the Richmond Hotel fire at Buffalo. Mr. Boyd was special agent of the American Bell Telephone Company, and was universally esteemed by a very large circle of electrical acquaintances. A dispatch from Mr. T. B. Doolittle, of the Bell Company, which reached this office Wednesday afternoon, too late for mention in last week's REVIEW, was the first reliable information received in New York of Mr. Boyd's sad death. He was very near-sighted, and, if aroused by the bell, was probably unable to discover any way out, and his remains are now buried in the ruins of the hotel. The REVIEW, with scores of others, deeply deplores this terrible death which came so suddenly to a capable and honorable man, one of the best informed and most popular members of the Bell Company's staff.

ELECTRIC LIGHT NOT WANTED AT CAYENNE!

There is to be no electrical illumination of streets in Cayenne, W. T., after all!

The genial and ingenious promotors have packed up their instruments, their coils of wire, lamps and dynamos, and turned their backs upon Cayenne and prosperity.

Like the alchemists of old, they had come prepared to turn iron and copper and brass into gold and silver, and, courage being an essential to all enterprises of pith and moment, they brought with them a nerve that the broadside of a man-of-war would not serve to shake. Now, as we remarked before, they are gone, and when you mention electric lighting in Cayenne the girls grow red with deep-seated indignation and toss back their heads in frigid and haughty expostulation, whilst the men instinctively feel for their shooting irons.

Yet this whole sad affair is the result of a misunderstanding—a mistake, indeed, which no amount of foresight on the part of the electrical promotors would have served to prevent.

It seems that prominent citizens of Cayenne had for some time been in negotiation with the electric lighting people looking to lighting up this thriving town with electricity. An understanding having finally been arrived at, a central generating station was built, lines run through the streets and lamps hung. Before the installation was completed, however, a furious wind storm arose and continued for seven successive weeks. The ground, in consequence, became very dry, and the friction of the wind charged everything with the electric fluid, even to the citizens themselves, those only being exempt who, from long exposure to more potent fluids, had become as it were, non-conductors. It was clearly no fault of the electric lighting people that the wind blew so furiously over Cayenne or that the air was filled with electricity, which, as we know, was a natural consequence. But the towns people thought differently. A mass meeting was held and the following note, being the sense of the meeting as expressed by a committee of its appointing, was sent to the hotel where the electricians were lodged:

"Jentlemen your raisin' hel here haint yer now this here lectrical bisness is got to stop its a-swiping the hull town ter pieces an' weeve got ter chose wether we'll have the town or the lectricity ez weeve unannymusly chose ter have the town we herby noticeify yer that yer have got ter get out an' take the hull outfit with yer ef yer dont we'll take our turn at raisin' hel.

THE KOMMITTY."

As might have been expected, there was consternation in the electrical camp at the reception of this letter. An attempt was made to argue with the committee, but without avail. Then the electricians held a council of war to bethink them of some means of appeasing the wrath of their would-be patrons. What should they do? That was the question!

Col. Ommeter thought of a plan. There was to be an excursion that afternoon to Lake Yahoe, down to the foot of the mountain, to give some of the young people a chance to get out of the wind and away from the electricity, and the electricians decided to go, in hopes, by generous good fellowship, to show at least a portion of the community that they were not as evilly disposed as had been represented. Their efforts were meeting with great success, when an unfortunate affair happened which blasted their hopes, and struck a blow at electrical science, which it is not likely to recover from in a whole generation. They had invited a number of the young women to drive back to town with them in a great hay wagon, and, the weather being extremely cold, they thoughtfully had a lot of bricks heated on a red-hot oven at a neighboring farm house to keep the girls warm. These bricks they concealed under the straw whereon the young ladies were to sit. They had not proceeded half way home, however, when the young women, who, at the start, made the way merry with laughter and hilarity, suddenly quieted down. At first they only looked thoughtful, then they became melancholy, and soon the surprised electricians discovered their fair charges to be regarding them with anger and indignation. What was the matter! They soon learned, or rather they soon guessed. "You stop this here cart ter onct!" demanded one of the girls, and she made a dash for the rear of the cart, as if she couldn't even wait for the horses to be pulled up. Then all the young women filed solemnly out, and, with deep indignation on their faces, seated themselves on a bank of snow at the side of the road. When they'd got cooled off, refusing all invitations to re-enter the cart, they walked flauntingly homeward.

"So they charged our gals with their cussed 'lectricity, did they?" exclaimed the townspeople, when they heard of the affair; "well, they can't stay another hour in this here town, b'gosh t'almighty!"

A committee conducted the electricians out of town that evening, and Cayenne, W. T., is still lighted with tallow candles.

OUR CHICAGO LETTER.

There has been a misunderstanding between the Manitoba and the Northern Pacific railroads, the latter having undertaken an exorbitant squeeze in the matter of freight on steel rails which were needed at the farther end of the new branch to Great Falls, Montana, and to Helena.

Electricity lets the Manitoba people out of the squeeze. The 580 miles will be built from the Eastern end, and in order to accomplish the work in time, gangs of men will work night and day by electric light, and $100,000, which the Pacific wanted for being neighborly, is lost to it forever.

There are now in the Illinois Legislature no less than four or five bills for regulating telephone charges. In the Senate the other day, a sub-committee on the Bacon bill "had a time of it," and two reports were made. $25 per year being the original rate under the bill. The majority favored $36 per year, the others a rate of $48. The majority report was adopted, and the bill recommended to a passage.

Mention was made in this column a few weeks since of an application for underground privileges by some new company, and a remonstrance by prominent property holders.

It was generally believed by the mass of our citizens that the original underground company had a sort of preemption claim on all the "underneath" of Chicago, and that it was next to an impossibility to break the charm. The action of the council on the 21st of March dispelled this illusion. An ordinance, which for a long time has been biding its time, was passed by a vote of 36 to 6.

The general provisions of the ordinance permitting the Western Edison Electric Light Company to lay wires underground for the purpose of supplying electricity for light, heat, and power, was taken up. A remonstrance was presented from owners of property in the business district, and also a peti-

tion in favor of it, the latter being much the larger, the signers wanting electricity, owing to the approaching consolidation of the gas companies. The ordinance was passed. It gives the right to open all streets, alleys, sidewalks, etc., and requires a bond of $50,000 to save the city from damages. The company must extend its conductors and supply electricity upon any street when ordered by the Council, provided enough consumers ask for it to yield 6 per cent. net on the cost. The franchise is for twenty-five years.

It has been well understood by the majority of the electric light fraternity here that attempts were being made to consolidate the various interests into one grand combination, and thus control, in advance, the possible lighting of the city in the near future. Various attempts have been made to accomplish this, and there have been no less than three different companies engaged in the scheme. Whether any one of these has been able as yet to accomplish the end sought, or can, remains to be seen. One thing is certain: If the various central plants are reorganized under one general management, it is but reasonable to expect that one uniform system of action and business principles will govern the whole organization, and one head will be responsible for the total success of the enterprise.

Then when an officer finds an electric light wire which is out of place or liable to do mischief in any way, the ownership may be determined at once, without cutting the wire and waiting for the owner to come and see what ails his line. Nearly every telegraph and telephone man can appreciate the convenience of such a condition of affairs, and see where the laugh comes in.

On the 21st the Secretary of State issued license to the Universal Electric Company, at Chicago; capital stock, $100,000; incorporators, William E. Hale, Norman B. Ream, and James B. Smith.

The parties named are well-known business men and capitalists here, and recognized as successful pushers. The organization means business.

Speaking of the electrical business brings up the matter of the Central Electric Company, whose advertisement appears in the REVIEW. Mr. M. T. Greene, the president, is a well-known Chicagoan, while the Messrs. McKinlock, Geo. A. and Wm. H., treasurer and secretary, respectively, are from Detroit, and till recently with the well-known Detroit Electrical establishment. The firm purposes manufacturing and dealing in all forms of telegraph, telephone, and electric light supplies, bells, annunciators, and some few specialties in the electrical line.

The gentlemen come well recommended, and will receive the right hand of fellowship from all the Chicago electrical people, whom they will be pleased to see at 38 and 40 La Salle street.

The tunnels under the river are lighted by the Edison system, sixteen candle power lamps. Of these there are 276, which have been in constant use for fourteen months twenty-four hours per day, or 2,782,080 lamp hours. During this period 772 lamps have been renewed, which gives as the average life of a lamp 3,600 hours. The uniformity of pressure on this plant is to a great extent responsible for this excellent result, as it goes without saying that a fluctuating pressure, now above and now below the normal, will materially shorten the life of any incandescent filament; and while this fact should only be whispered, for fear of consequences, it is one of the serious drawbacks to successful incandescent lighting on arc circuits.

Every time that an arc lamp feeds or takes snuff, every incandescent lamp sneezes, and as nearly as possible courtesies, and says, "Thank you, sir."

Mr. W. H. Johnson, of Louisville, Ky., well known as a mechanical electrician of the olden time and of the first grade, paid a visit to Chicago last week, and renewed his youth and the memories of the days that were, among old acquaintances.

Mr. Cyrus Emery, who has done more or less in electric light work, has just opened out for himself at Room 25, 115 Dearborn street, as a contractor for electric lighting.

CHICAGO, March 28.

OUR BOSTON LETTER.

J. W. Fossinger, representing the Anti-Magnetic Shield and Watch-Case Company, was in the city last week, explaining to the electric fraternity, by the aid of some simple yet interesting experiments, the entire protection to watches from magnetization by the use of the anti-magnetic shield. It was found that in almost every instance the watches tested were magnetized to such a degree that their unreliability as timekeepers was fully accounted for. Mr. Frank Ridlon has just received a gold watch with shield protection, one cover engraved with a Swan lamp, the other with a Brush double arc lamp. A magnetized watch gains time. This accounts for the fact that certain electrical men are always ahead of the times.

The Sun Electric Company, of Woburn, are to install plants of their converter system of 300 lights at Rochester, N. H.; 600 Portsmouth, N. H.; Boston, 600. They are engaged in the construction of an 1,800-light incandescent alternate current dynamo, of 1,000 volts and 90 amperes capacity. This will be the most efficient alternate current machine constructed this side of the Atlantic, 3½ per cent. of the energy being required to maintain the field. The company are working to their full capacity, and are prepared to furnish self-regulating and self-exciting machines for producing alternate currents.

The Newburyport (Mass.) Electric Light Company are building a new electric light station, the contract for which has been awarded to the Jarvis Engineering Company. The same company have supplied a new Armington & Sims engine to the Citizens' Electric Light Company, of East Boston, who were recently burnt out, another for the Northampton Electric Light Company, and are setting the boilers of the Suffolk Cordage Company, Chelsea, with their patent furnace. The cordage company will light their factory by electrcity.

The Hospital Life building, State street, have a fine 600-light Edison plant, which is run during the daytime. It has been found that the gas bill for the few lights used while the engines are not running, is nearly $200 per month. An installation of accumulators supplied by the Electrical Accumulator Company, of New York, is to supply current to the system while the engines are not running. The same company have received a large order from the Old Colony Railroad to equip a number of cars with storage batteries for train lighting.

The working of the Meigs Elevated Railway at East Cambridge is at last successful. Col. Meigs has constructed a grade and curve which are seldom found in actual practice. It is expected that the company will be permitted to build a practical working line in some part of Cambridge. There will undoubtedly be a strong opposition to the extension of his system, for the Colonel insists on a steam locomotive, while the public are becoming educated to the use of electric motors.

Among State House items are these:

A bill came from the manufactures committee authorizing the Milford Electric Light and Power Company to increase its capital stock to $60,000. Senator Alger, from the committee on mercantile affairs, reported inexpedient on the order relative to legislation concerning the regulation of telegraph and telephone companies in the State. Senator Jefts, from the committee on manufactures, reported a bill authorizing the Milford Electric Light and Power Company to increase its capital stock to the amount of $60,000. Senator Alger, from the committee on mercantile affairs, reported inexpedient on the order relative to legislation placing telephone companies under the control of the railroad commissioners. Senator Alger, from the committee on mercantile affairs, reported inexpedient on the order relative to legislation concerning the amount of stock that may be held by telephone companies in other corporations doing business under their licenses.

M. Camille Faure, late of Paris, now connected with the Electrical Accumulator Company, of New York, has been in this city for the past few days. M. Faure explained the formation of the plates and the essential improvements in the system. The lead plates or grids are perforated with large numbers of holes, the central diameter being smaller than the outside. Red oxide of lead or litharge is mixed with a solution of sulphuric acid and water of a certain strength, and before the red oxide or litharge has changed to sulphate of lead the paste is put on the plate, filling the hole completely. In a short time the paste hardens and the plates then are placed in a bath of dilute sulphuric acid and water, and formed by the passage of the current from a dynamo. The counter electromotive force during charging is about 2.25 volts, of discharging 2.15 volts. If not over-charged the plates will last for years The oxidizing of the lead support occurs only when the active coating is fully charged, and if no over-charging (which is shown by the evolution of volume of gas), is done there can be no disintegration. Just before the peroxidizing of the support takes place, and the consequent destruction of the plate, the counter electromotive force rises to 2.5 volts. There is, therefore, an increase of ¼ volt per cell between the safe and harmful amount of charge. If, as is usual, at least 20 cells are joined in series, there is a difference of 5 volts, many times enough to work automatic devices to cut the battery out of the charging circuit at the right time.

BOSTON, Mass., March 29.

Telephone Rates in Massachusetts.

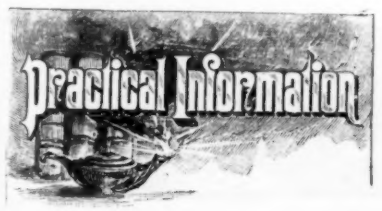
A bill to establish rates to be charged for the use of telephones in this Commonwealth and fixing a penalty for its violation was submitted to the committee on mercantile affairs by the petitioners. It provides that in a territory with a population of less than 10,000 not more than $3 a month shall be charged for one set or pair of telephones rented by the same party, provided they are operated within one mile of the central office of the exchange, with 50 cents additional for each mile. In places of less than 100,000 population an additional charge of $1 a month may be made, and in exchanges serving a territory of 100,000 or more, the following rates are established:

Within one-half mile of the central office for special wires limited to one subscriber, for business purposes, $5 per month; for residences, $4. For wires limited to two parties for business purposes, $4.33; for residences, $3.33. For wires having four or more subscribers for business purposes, $3.50; and for residences, $2.50. Fifty cents per month additional to above rates in the territory last described may be charged for each additional half mile of distance from the central office of such exchange.

Violations of the act are to be punished by a fine not exceeding $25 for each offense.

The town of Sandy Hill, N. Y., is to have the Thomson-Houston electric system for lighting their streets, and the work is now going forward rapidly, the machinery being furnished by the Ball Engine Company of Erie, Pa. The engine is a 13x12, and is to have a clutch on one wheel so arranged as to enable them to use an extended shaft later if their business increases. This is a wise precaution, and saves expense.

An interesting invention to the scientific world is reported from Paris, being a new "micro telephone push button" original with Dr. C. Herz. It was used in connection with the Paris-Brussels line and is said to contain all the essential parts of an ordinary telephone transmitter and receiver, so arranged that a very compact apparatus is secured. The receiver consists of an ordinary iron diaphragm, behind which is a polarized electro magnet, and the transmitter consists of a carbon diaphragm against which rest seven short carbon pencils, arranged in two rows above each other, four in one and three in the other row. These pencils are placed in a block of carbon perforated with holes at an angle, and have therefore a tendency to slip forward and make contact with the diaphragm, which tendency is assisted by a shot placed behind each carbon. Speech, it is said, is transmitted with good results.



To saw cast iron, rapidly place in a fire, and, when red hot, remove and saw quickly with but little pressure on the saw.

Hard polish on the wood work of measuring instruments may be obtained by using best Japan varnish, drying in an oven free from dust at 225° Fahr. If the work is required to be very smooth, it must be rubbed down with fine sand paper, or ground pumice stone in water, according to the requirements of the work, then put on another coat of Japan, and bake as before.

QUERIES AND ANSWERS.

To the Editor of Electrical Review:

a. What would be the E.M.F. of a No. 2 magneto blasting machine dynamo, running 2,000 revolutions per minute? *b.* What kind of battery will give enough power to give a shock for medical purposes? Would a Bunsen-Lothrop Grenet do it? *c.* If so, how many cells would it require? Would a battery of the above kind run a small 16 candle power incandescent lamp? Please answer, and oblige, YOUNG ELECTRICIAN.

Richmond, Me., March 28, 1887.

ANSWER:—*a.* It depends on the size of the armature, the length of wire on it, and the strength of the magnets. Perhaps 20 volts.

b. One or more Bunsen or Grenets will answer. The shock depends as much on the winding of the induction coil as on the number of cells used.

c. About 15 gallon Bunsens. Use a low resistance lamp of not over 25 volts.

To the Editor of Electrical Review:

How many horse power are required to run an arc lamp, taking 45 volts, 4 amperes?

KLARK.

ANSWER:—$4 \times 45 = 180$ watts. There being 746 watts to the electrical horse power, there would be $\frac{180}{746}$ or a little less than ¼ horse power. As dynamos convert about 90 per cent. of power used into current, it would require somewhat more than ¼ horse power developed by the engine.

"A. & B.," Ansonia, ask virtually if a wire can be heated by an electric current passing through it.

ANSWER.—Yes. The amount of heat which may be developed in any piece of metal is governed by:

1st. The amount of electrical energy which is sent through the wire or other form of metal, and

2d. By the resistance which the wire or other medium presents to the passage of the electrical energy.

Hence, the greater the force, and the greater the opposition—in electricity we call it resistance—the less current is carried, and the more heat is developed, until, by using fine enough wire, enough current will be converted into heat to fuse the wire.

The difference between the capacity to carry a current of electricity is very great between various metals and other substances. A copper or silver wire of the same size will carry a much heavier current than an iron one, and one of German silver much less than either.

A moment's thought will satisfy all the queries in the case, when we remember that the electric light is but a conversion of one form of force into two other forms—electrical energy into light and heat. A very positive answer to the question if a "wire fastened to a dynamo can be made hot" is found in the coils of the field of the machine, which still show heat, sometimes for hours, after the plant is shut down. Heat, light, magnetism, are but three different forms of the same force.

Telephonic News

*** The Victorian Government has decided to establish a telephone exchange at Melbourne.

*** Over in California they have found out that they can telephone along the lines of barbed wire fences. This is fine for gossiping neighbor women. The men now do all their jawing about unruly stock and the like at long range. This may prevent the shootings which have so often disgraced the ranchmen as a class in California.—*Virginia City (Nev.) Enterprise.*

*** Cortland, N. Y., has 88 telephone subscribers, and is third in size of the exchanges under the management of the Empire State Telephone Company, Auburn being first and Oswego second. Trunk line connections from Cortland are to be had with Syracuse, Rome, Utica, and with Binghamton, Scranton, and other points reached by the New York and Pennsylvania Telephone Company.

*** The Consolidated Telephone Company, who have exchanges in Prague, Lemberg, Czernowitz, Trieste, and Graz, have arranged a service to transmit by telephone to their subscribers any telegraphic messages arriving at the head offices. The system works well, and is becoming popular. Such a plan has long been working in this country, but seems to have just come to the Austrians.

*** A dispatch from Watertown, Dak., says: The Watertown Telephone Company completed its organization to-day, with a capital of $25,000. It will connect with outside towns, starting off with 75 subscribers. The line will be operated inside of 30 days. H. R. Pease, president; W. R. Arnold, vice-president; B. F. Budd, secretary; O. E. Dewey, treasurer, and nine directors will manage the affairs of the company.

*** In the case of the American Bell Telephone Company against the Pan-Electric Telephone Company and others, Judge Morris in the United States Circuit Court at Baltimore passed an order last week, that the defendants be adjudged guilty of contempt of the order on injunction issued by the court July 19, 1886, and directed that they forthwith deposit with the clerk of the court all the transmitters and receivers, including the boxes which contain them, in accordance with that order, and that they pay a fine of $100 to the complainants.

*** The India Rubber and Gutta-Percha Insulating Company, of this city, are manufacturing at their works, 537 West 24th street, probably the largest electric cable ever made. It consists of 277 copper conductors, and is being specially constructed for the use of the Metropolitan Telephone Company in its new building on Cortlandt street. The cable is 2½ inches in diameter, and 3,000 feet in length. It was made under the direct supervision of Mr. W. M. Habirshaw, the general manager of the above company.

*** The American Bell Telephone Company filed two bills of complaint in the Circuit Court of the United States for the district of Maryland one day last week—one against Martin Jordan, Daniel Murray, Erasmus Levy and William C. Plummer, of Baltimore, and the other against Caleb J. Moore, J. Wilson Moore and Daniel P. Hollingsworth, of Fallston, Harford county, Md., for alleged infringement of the Bell telephone patents. The Baltimore parties are charged with operating a speaking telephone on a line connecting No. 60 West Fayette street with No. 62 West Fayette street, No. 66 West Fayette street, and No. 39 North street. The charge against the Fallston parties is connecting the store of Moore Brothers with the residence of either of the members of the firm and with the residence of Daniel P. Hollingsworth. The bills are filed by Mr. Charles J. M. Gwinn, counsel of the Chesapeake and Potomac Telephone Company.

*** There is no longer any doubt that Mr. Robert S. Boyd, of Boston, special agent of the American Bell Telephone Company, lost his life in the Richmond fire, says the Buffalo *Commercial*. The conclusion is reached by a remarkable chain of circumstances. Messrs. Wm. A. Hovey and Thomas B. Doolittle of Boston, both special agents of the Telephone Company, have been busily investigating the matter, and have made the following statement for publication. "We know positively that Mr. Boyd left Syracuse for Buffalo on the 2 o'clock P. M. train on Thursday last. Mr. Timpson, general superintendent of the Empire State Telephone Company, accompanied him to the train, which reached Buffalo at 7 P. M. Mr. Whitaker went on duty as clerk at the Richmond at that hour. Mr. Nicholson, general manager of the Central New York Telephone Company, late that afternoon sent a telegram to Mr. Boyd at Buffalo, addressed to the care of the Bell Telephone Company of Buffalo. It reached here after the telephone office was closed, and the Western Union telephoned Mr. Harlow C. Palmer, the secretary and treasurer, at his residence, asking where the dispatch should be delivered. Mr. Palmer instructed them to try the Genesee and the Richmond, and if Mr. Boyd was found at neither house, to deliver the telegram at the telephone office on the following morning. A messenger boy took the telegram to the Genesee and not finding Mr. Boyd there, took it to the Richmond, where Mr. Whitaker receipted for it at 9.40. Mr. Whitaker remembers the circumstance by a playful remark he made to the boy, and which the boy corroborates. Mr. Boyd must have received the telegram almost immediately, as he answered it at 10.10 P. M. from the Western Union main office. Had the telegram been addressed to Mr. Boyd at the Richmond, Mr. Whitaker would have receipted for it without looking at his books, to see whether Mr. Boyd was in the house, but the boy having been instructed to bring the telegram back unless he found that Mr. Boyd was a guest at one hotel or the other, proves that Mr. Whitaker did find his name on the register."

A New Electric Railway to be Built in Pittsburgh by Detroit Electrical Works.

Pittsburgh, with all its resources, is woefully deficient in pleasure resorts. A party of Pittsburgh capitalists, consisting of John H. McCreery, R. D. McGonigal, John A. Caughery, William N. Short, Col. Wm. N. Stone, and others, have taken the matter in hand and bought a large tract of land at Bellevue, a beautiful suburb situated six miles below Pittsburgh, on the Alleghany River. The village is situated on a high bluff about 150 feet above the river. It is the purpose of the gentlemen to transform this village into a monster pleasure ground. It is already within easy access of Pittsburgh by rail, and in addition it is their intention to establish a line of fast pleasure boats, enabling excursionists to reach it by rail or water. The excursionists will reach the bluff by a powerful hydraulic lift now being erected by them. Once on the bluff the excursion and picnic grounds will be reached by an electric railway.

A committee appointed by the above named company carefully investigated the merits of all the different electric railway systems now in use, and unanimously decided that the system built by the Detroit Electrical Works was the best they had seen.

Frank E. Fisher, manager of the Detroit Electrical Works, has just returned from Pittsburgh, having obtained the contract to build and equip the electric railway there, which will cost between $15,000 and $20,000.

—— At Huntsville, Ala., Mr. Geo. Hawkins has organized an electric light company. The capital stock is $20,000.

Interview With Alexander Graham Bell.

Mr. A. G. Bell delivered a lecture at Cornell University recently, and spent Monday and Tuesday with his sister, Mrs. Ballachey, at Brantford, Canada. Arriving in Rochester, N. Y., he was interviewed by a reporter of the *Union*. That town was at one time the residence of the Bells, and is where the telephone was invented. It is called the "Telephone Town" because of this fact. The first experiment in real lines was made in Brantford, over the Dominion Telegraph Company's wires. Mr. Bell says that he used all the stove-pipe wire in Brantford to connect his house with the telegraph wires. The invention was successfully demonstrated and on January 20, 1876, a patent was sworn to, which was granted by the American government on March 7th of the same year. The next patent obtained by Mr. Bell was on January 25, 1877.

"Under what patent are the telephones now in use, Mr. Bell?" asked the reporter.

"Under my first patent. Soon after this was granted I organized a company in Boston, which is the same one in existence to-day."

"What is the object of your visit to Rochester?"

"We came here to inspect the school for the deaf and dumb, of which we have heard so much and which we have never seen. We are told that it has an admirable system in practice, which excels that of any other institution in the city. We wish to learn the details of the system and we are greatly interested in these institutions. We attended the rendition of the Merchant of Venice by Bandman at the Grand Opera House last night. Mr. Bandman," said Mr. Bell, Sr., "was my pupil at London, Eng., and I take great pride in him."

"I presume you know that the Bell Telephone Company is having a little trouble with its Rochester subscribers?" the reporter asked Mr. Bell.

Said Mr. Bell: "I do not know anything about the business of the company, as I pay no attention to it. I think that its position in this case is right. I see no other equitable plan than to charge so much per message. Perhaps a charge of 10 cents for a conversation is too high. That phase of the question I will not discuss. But I do maintain that the principle of making a *pro rata* charge is correct. The telephone business is unlike other enterprises, in the fact that as its business grows its expenses become greater. A wholesale business will cost less in proportion than a retail business. But with telephone companies the case is different. For instance: I operate an exchange of fifty subscribers. It is augmented to one hundred patrons. Is it not a fact that each individual subscriber will use his instrument more when there are twice the number of 'phones? This, of course, entails a greater expense on the company, and I think it is but right that subscribers who use their instruments most should pay most. The stock broker or any business man who uses his instrument continually during the day, should be required to pay more than the person who uses it but occasionally. I could talk for hours on this subject, but I am afraid your readers would become tired. In a few places telephone meters, on the same principle as gas meters, have been used. But I do not think they will come into general use."

The conversation turned again on telephones.

"My opinion is that the suits which the Government at Washington is heaping on the Bell Telephone Company are all farces. I am the proper person against whom suit should be begun. If there has been any fraud committed I am directly chargeable with it. The Bell Telephone Company is an innocent holder of the patent and is not responsible for any frauds alleged to have been committed. If any fraud was perpetrated in the application for the patent I should be tried and convicted for it and sent to prison. The first suit which was begun against our company by the Government was in Memphis, Tenn. This action was non-suited owing to the formality which the Government's attorneys omitted in not first submitting the matter to the Interior Department. The next action was in the State of Ohio, and was thrown out. In New Orleans, the home of the Pan-Electric people, a case was decided favorably to us. Every court that has considered this litigation has made a decision in our favor. I have never been sued personally, the Government always preferring to harass the company. A suit has been commenced against the company in Boston, the outcome of which I have no doubt will be in our favor. The evidence in the suit before the United States Supreme Court, in which the argument has just been concluded, was very voluminous, and consisted of 20,000 printed pages. Over $100,000,000 are invested in the telephone interest of this country on the strength of my patent. There is no consistency in the Government's prosecutions for illegality of patents against me, and I do not hesitate to say so."

"Your residence was burned at Washington recently?"

"Yes, about six weeks ago. More damage was done by water than by fire, and the loss can be repaired. I am temporarily residing on Rhode Island avenue. I see the newspapers are publishing the statement that my extensive library was entirely destroyed. Will you please say, for the benefit of those who know the value of my collection of books, that it was only slightly damaged? I have received numerous letters from friends inquiring about the loss, which is not as great as it is generally supposed to be."

Something About the Electrical Subway.

Mr. William McMahon, of Rahway, N. J., has brought suit against Maurice B. Flynn, Judge William H. Kelly, the Consolidated Telegraph and Electrical Subway Company, and the American Insulated Conduit Company. He says that he made a contract with Flynn and Judge Kelly, June 10, 1886, by which he was to receive $150,000 in stock of the subway company, to which was granted valuable concessions by the Subway Commissioners of this city. The stock was never delivered, and McMahon asks the court to award him $150,000, with interest from Sept. 15, 1886.

In the testimony taken before U. S. Commissioner Shields, Mr. McMahon said he had arranged with Flynn and others to go in with them, turn over his patents and those he had purchased from Stephen D. Field and F. B. Ray, and receive a share of the stock of the new company. "I wanted it decided how much I was to receive for my work," testified Mr. McMahon, "and an interview with Flynn was arranged for that object, Judge Kelly being present. I was offered $60,000 in stock and $5,000 cash, but declined. Flynn said he would give me a call on the stock, but I said it was not listed, and wouldn't take that. Afterwards he asked Senator Ecclesine to prepare a contract, and Judge Kelly was to draw up another. When we met again the Judge's form was objected to, and finally that of Senator Ecclesine was accepted. Judge Kelly, Flynn and myself signed the contract and Mr. Ecclesine witnessed it. Judge Kelly said he was authorized to sign for the Dorsett Company, as he had a power of attorney from them. There was only one copy of the contract, and it was given to Mr. Ecclesine as custodian, and he placed the document in the envelope in my presence and sealed it with his ring."

An envelope was identified by Mr. McMahon as the one holding the contract, which was only to be opened by consent of all parties. In further explanation the complainant said: "I told Flynn I thought $3,000,000 capital too small for the company, and it ought to be $5,000,000. It had been arranged that I should receive $250,000 of stock, but Flynn said if the capital of the company he had organized remained $3,000,000 I was to receive $150,000 in stock instead of $250,000. At an interview at the Astor House Flynn said he could control the Dorsett system for New York and also use their material for sewer pipe.

Cables to Help Them Out of the Difficulty.

Mr. J. W. Tillinghast, of Buffalo, N. Y., who is connected with the Western Union Company, has sent the suggestions published below to the Mayor of Buffalo. The feeling against overhead wires is very strong there at the present time, owing to the obstruction the wires are said to have been to the firemen in handling their ladders at the recent Richmond Hotel fire. Mr. Tillinghast's letter suggests an increase of cables on higher poles, as the quickest means to get rid of the great number of wires, and is as follows:

LETTER TO THE MAYOR.

Hon. Philip Becker, Mayor of the City of Buffalo.

DEAR SIR: Allow me to suggest what I consider to be the most practical plan for speedily removing the existing danger to life and property, due to the enormous growth of electrical wires on our principal thoroughfares.

I desire that it shall be distinctly understood that I make the suggestion solely in my capacity as a citizen; that the telegraph company which I represent in this city has not been consulted in regard to the plan, and that I have neither asked for, nor received any instructions or authority in regard to it.

All reasonable men must concede that it is vitally important to the commercial and industrial interests of the community to have uninterrupted telegraphic and telephonic communication within and without the city.

That the time will come when the wires can be buried in a practical manner satisfactory to all parties, I verily believe; but there are difficulties yet to be overcome, and it is likely that a considerable period may elapse before this much to be desired result is reached

In the meantime I suggest for the consideration of all interested the following:

In all streets or portions of streets where electrical wires are carried on pole supports in large numbers, and where such poles and wires are fronting buildings of more than two stories in height, the various companies shall be required to erect and maintain cedar or pine poles of sufficient strength for the purposes required and not less than fifty feet high from the street level. This height to be increased in all cases where the height of adjacent buildings demands a longer pole.

That one cross-arm only shall be permitted upon each pole, to be placed at the top.

That all electrical conductors required on such routes shall be carried in cables supported upon said cross-arms.

That the number of cables supported by one pole or set of poles shall not exceed eight.

That a commission consisting of the chief engineer of the fire department, the city engineer and a member of the board of fire underwriters shall be clothed with authority to prescribe and regulate the length and size of all poles to be erected or maintained under this plan.

The above is a hastily sketched plan which I believe can be speedily carried out and which will remove completely the dangerous character of the overhead work.

These poles may be from 50 to 100 feet high, according to the requirements of the case, and thus the wires would be removed to a height amply sufficient to prevent any difficulty whatever in cases of fire.

It seems to me that it is preferable to adopt such a system until the problem of underground work is clearly defined.

That we remove thereby the dangerous element now causing so much anxiety, and also avoid the expense and annoyance attending underground work of an experimental nature requiring the frequent and vexatious opening of streets, etc.

Let the cities now engaged therein solve the problem of successfully burying the wires and then we can act with full knowledge.

Yours truly,
J. W. TILLINGHAST.

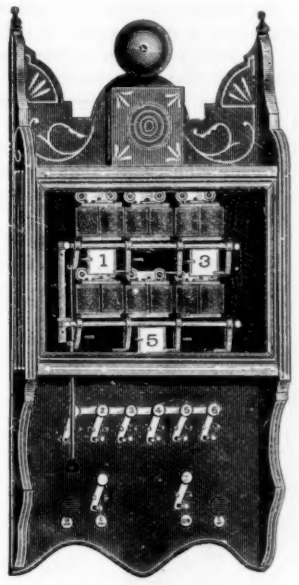
BUFFALO, March 19.

Barbed Wire Telephone Line.

The favorite telephone line of N. D. Rideout, between Marysville and Sacramento, says the Marysville *Appeal*, has been in bad working order since the late rain, and a few days since J. D. Cushin and assistants were sent down the line. They got as far as Bear river, where it was found that over half a mile of the wire was missing at a point in the bed of the stream. Knowing that the use of the line was desired at once, and having no time to come to Marysville to secure wire, he thought to try a novel means. He dragged the ends of a barbed wire fence near the railroad track and attached them to it. Upon returning to Marysville in the afternoon he asked the employes at the bank how the wire was working, and they said it was doing fine. When he informed them that their message was passing over a half-mile of barbed wire it caused a look of wonder to come over their faces. This is the first feat of the kind which has been recorded.

Telephonic and Telegraphic Communication in India.

The telephone has proved a great success in India, and the company which introduced this popular instrument has managed to start other local telephone companies, which have, in their turn, built up the nucleus of a sound business. The early days of telephony have not been "plain sailing," as the Government of India have opposed the erection of telephone lines, and still interfere with the development of telephonic communication, on grounds somewhat similar to those taken up by the English post-office. The Indian telegraphs are under a Government department, who jealously guard their rights, forbidding all private lines except those erected by themselves, for which a rent is charged, so that, at the present time there are no telephones to districts outlying the large towns. It is proposed to run a telephone line for a distance of eighty miles along the line of pipes and conduits which will bring the water supply of Bombay from the artificial lake now under construction at Sansa, so as to place all the valve houses in communication with the engineer's office in the city. The telephone interests are controlled throughout the Indian Empire by the Oriental Telephone Company, who have started subsidiary companies in Bombay, Calcutta, Madras, and Kurrachee. The Bombay Telephone Company, which may be taken as representative, commenced operations about four years ago, and has 350 subscribers, who pay different subscriptions; that for merchants, banks, and mills, being £15; for shopkeepers, £12; and for private use, £7 15s. per annum. There are also eight call boxes, on the exchange system, for which the charge for each conversation is two aanas, or about 2¼d., taking the exchange at 1s. 6d. for the rupee. The police and fire stations are also in communication, and all the exchanges are open day and night, Sundays included. The system employed is the Blake transmitter and Gower-Bell telephone, with magneto call bells instead of batteries, which would require constant attention in the hot season. The wires are principally of phosphor bronze, 17 B.W.G., as iron is found to decay; they are run on insulators supported by brackets, which are fixed to the walls of the houses, at a sufficient height from the street to allow of a loaded elephant passing under. This plan was necessitated on account of the flimsy character of the roofs, which would not bear a pole and wires. The lines within the native town have to be watched by a patrol, whose duty is to remove obstructions, as the wires offer advantages for drying clothes which the people appreciate, and in spite of constant inspection, at times the working is stopped by similar obstacles. Earth returns are used throughout the system, and appear to be satisfactory; there is little induction or leakage. At Rangoon, however, it was found impossible to converse until fluid insulators were employed, to prevent the leakage. In Bombay, female operators attend to the calls, whilst boys are employed in the other towns. The number of calls at Bombay averages thirty-four per subscriber per week; at Calcutta they are twenty per week, and the difference is accounted for by the greater number of native subscribers at the former city, who use the telephone on every possible occasion, and it is principally for them that the night service is maintained. The excessive talkativeness of the natives is supposed to be the reason why the Government object to the introduction of the telephone in the departmental offices, although, in a large city like Bombay, much time and expense would be saved by easier intercommunication. Killingworth Hedges, in London *Industries*, says: Telegraphic messages are transmitted in India at rates which are cheap, if we consider the enormous distances. There are three methods of sending Indian telegrams. First, those marked "Deferred," which are messages tendered for transmission at the convenience of the telegraph department, but to be delivered at its destination early on the following morning. For this class the charge is eight annas (9d.) for eight words or less, with one anna for each additional word, the address being in all cases free. "Ordinary" messages cost double the above rate, and there is another description termed "Urgent messages," which are tendered for immediate transmission with priority over the "ordinary" kind, and for this privilege they are charged double, or at the rate of eight words for two rupees (3s). There was formerly a "local tariff," but this has been abandoned, so that it costs the same to wire from one part of a town to another as to the other end of India. Money orders can also be sent by telegram, and are paid at all post-offices, a commission being charged, according to the sum forwarded.



Gravity Burglar Alarm.

There has been quite an increase of late years in the demand for electrical protection from burglars, and as a result enterprising electrical houses have reaped a substantial benefit. Among these none has been the recipient of a more gratifying trade than the Electrical Supply Company of 17 Dey street this city, one of whose gravity burglar alarms of six drops is shown on this page. The claim of the company that this instrument is neat, reliable and perfect working would seem borne out by the fact of the demand for it among electrical workers and house builders. It has no complicated combination of springs to get out of order. Relying entirely upon gravity for its action, once a current is sent through the coils the drop must fall. The "throw back" raised to replace the drops in position must come back of its own weight. These instruments are arranged for continuous and momentary ring, and for battery and silent test, and are put up in finely finished cases of different design and the mountings nickel plated.

The Editor Wanted to be Sure of His Ground.

To the Editor of Electrical Review:

Enclosed paragraph (just clipped from a newspaper entitled the New York *Saturday Night*, of 12th instant), appears in exactly the same form in the "First Book of Natural Philosophy and Astronomy," published about twenty years ago, but still in daily use in every school in the United States.

If the New York *Saturday Night* intends to continue publishing matter which should be handled only by electrical journals, let it give us information of the present day, and not clippings from school books twenty years old. Doubless its next issue will inform us of the successful laying of the Anglo-American cable. J. BAKER.

Livingston, Ala., Feb. 17, 1887.

* * If Dr. W. Leigh Burton (not Barton as recently appeared in a communication) can solve the problem of furnishing safe heating apparatus for railway trains, he will be entitled to the gratitude of the entire civilized world. Electricity is the power that Dr. Burton proposes to control for this purpose.

TELEGRAPHIC

.... The Polar Telegraph Company was incorporated March 18, to build and operate a system of telegraph lines in Minnesota, other States and Territories and Canada. Principal place of business, Minneapolis. Capital stock, $1,000,000. Incorporators: Henry E. Fletcher, Preston King, Albert C. Loring, William H. Dunwoody, William H. Eustis, Minneapolis. President, Henry E. Fletcher.

.... A gang of linemen employed by the French Cable Company went over the route of the American Union lines, now part of the Western Union system, between New York and Boston last week, cutting two of those wires at every place where they have been run into the Western Union offices. The French Cable Company has opened test offices along the route and will, it is understood, soon arrange to compete with the Western Union for the local cable business. The trouble between the companies grew out of the French company's withdrawal from the cable pool. The French Cable Company claim two wires from New York to their Cape Cod office.

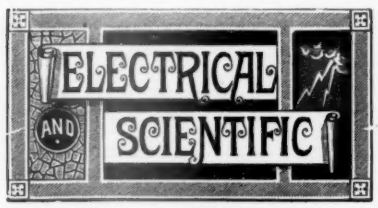
.... From a parliamentary paper, just issued it is shown that the gross amount received and expended on account of post office telegraphs during the year ending March 31, 1886, was £1,832,401, showing a balance of expenditure over receipts of £45,137. The chief item of receipt is £1,974,852, the gross amount received by the office in respect of telegraphic messages, rentals of private and special wires, which has to be reduced by £229,796 paid to submarine telegraph companies and moneys refunded. The chief item of expenditure is £1,733,104 expended by the office in respect of salaries, rent and maintenance. The balance already mentioned by no means shows the real excess of expenditures over receipts, for a sum of £326,417 has to be added as one year's interest on the £10,380,571 of securities, and this makes the deficiency for the year £371,554, which may be compared with £362,767 of the previous year. Altogether the deficiency from the beginning of 1872 to March 31, 1886, has been £2,553,009. The only year when anything like a balance occurred was in 1881, when the deficiency was only £984. This increased next year to £112,524, and has one on rising (with a very considerable leap between 1883 and 1884) until the present year, which is the highest of all.

Western Union Officials in the West.

An inspection party of Western Union Telegraph Company officers were in Topeka recently, says the *Capital*. The party consisted of Colonel R. C. Clowry, vice-president and general superintendent of Chicago; J. J Dickey, district superintendent at Omaha; F. H. Stubbs, district superintendent at Chicago; M. C. Bristol, superintendent of construction of Chicago; Sol. Palmer, superintendent of construction of St. Louis, and C. W. Hammond, superintendent of the Missouri Pacific Telegraph. They were traveling in the directors' special car, and examined the Topeka office and found everything in first class shape under the management of Mr. S. J. Bear. Arrangements were completed for moving the office to new quarters which places it on the first floor.

The company has lately introduced the Wheatstone automatic system of sending and receiving messages on all their heavy circuits, and it is mainly to inspect the workings of this system that the party was on its present trip. Said Colonel Clowry to a reporter: "We can send and receive messages at least three times as fast by this system as we can by the Morse system. A larger force is required to operate it, but in a push of business it is a decided improvement over the Morse."

The party left at 3 o'clock for Atchison, and afterwards visited St. Joseph and Omaha



* * The State of Texas, which is about completing its new capitol, will cover it with copper, using about 800 squares.

* * The Davey domestic motor is now employed in some private houses in Paris for electric lighting, the current from the dynamo being directly used for feeding the lamps. So far, the motor has given entire satisfaction, the light being steady and the attendance very trifling.

* * In order to obtain a larger vertical angle of illumination from the arc electric lights used for light-house purposes Sir James Douglass has introduced a fluted carbon. This prevents the formation of a crater, and it is stated, gives a steadier and more uniformly distributed light.

* * In view of the great importance which torpedoes have assumed as a feature of modern naval warfare, special interest will attach to an article in the April *Scribner's*, by Lieutenant W. S. Hughes, of the Navy, in which he describes, for the first time in popular form, the recent remarkable development of torpedoes and torpedo boats designed for aggressive use, and the present status of this important branch of naval science. The article will be very copiously illustrated.

Reorganization of the Schuyler Electric Manufacturing Company.

At the meeting of incorporators of the Schuyler Electric Manufacturing Company, held on Thursday last, says the Hartford *Times*, a board of directors, consisting of Charles L. Buckingham, of the Western Union Telegraph Company, New York; John Byrne, of the Chesapeake and Ohio Railroad, New York; H. M. Pierson, of Brooklyn, New York; S. E. Elmore, of Hartford; C. N. Wayland, treasurer of the Holmes, Booth & Haydens Company, Waterbury; the Hon. Frederick Fosdick, treasurer of the Fitchburg Steam Engine Company, and mayor of Fitchburg, Mass.; and Charles E. Dustin, of Hartford, was chosen for the ensuing year. Mr. E. Henry Hyde, Jr., of Hartford, was also chosen by the stockholders treasurer of the company, it, however, being understood that this was to be temporary, to enable a certain other prominent gentleman to perfect his arrangements for accepting the office.

The stockholders expressed themselves as well pleased with the progress of the business, and with the hard work done by Mr. Dustin and the advisory committee appointed by the creditors since the time of the Bartholomew troubles. The Hon. Frederick Fosdick, as one of the advisory committee, spoke at length regarding the condition of affairs, and expressed himself as satisfied that the future of the company would undoubtedly be great, and that the stockholders of the old company, who were now by agreement and by the act of the Legislature incorporators of the new corporation, would receive the full amount of their stock, as the company had made most important progress in electrical apparatus, and more orders were coming to it than it could possibly take care of at this time. There seems to be practically no limit to the business, and as the company manufactures everything pertaining to the work in its own factory and under its own patents, paying royalty to no one, the prospects are most flattering.

At a meeting of the directors, held after the stockholders' meeting, Mr. Charles E. Dustin was unanimously chosen president, and Mr. C. H. Sewall, of New York, secretary.

We congratulate the officers of the Schuyler Company on having so successfully worked this matter through and under such annoying conditions.

Another Central Station in Boston.

The Edison Electric Illuminating Company, of Boston, has just secured a piece of property representing upwards of 6,000 square feet in the north end of Boston, running through upon two sides of a block, for the establishment of another large central station for the supplying of electric light and power. The cash for this property was paid down Saturday, March 19th, and the plans for the station are already being prepared and the work will be commenced at once. The principal station at Head place, off Boylston street, is rapidly approaching completion; and preparations are now being made to run a portion of the new 400 light dynamos and the 15½x15 Armington & Sims engines in order to supply the present lighting system from this building and enable the tearing out of the machines in the adjoining premises now occupied by the old station. It is intended at once to reconstruct this building into a fire-proof boiler house, which will contain 14 single return steel tubular boilers which will all be set with Jarvis settings, and a 2,000 horse power stack will also be erected in addition to the 600 horse power stack already in use. The company, since the first of the year, has installed over 2,000 Edison lamps, making a total of upwards of 7,000 lamps connected since the inception of the station a little over a year ago. It is at present running over 45 Sprague electric motors; and it is intended in the new station in the north of Boston to take up the question of the electric transmission of power on a much larger scale than is done in the present station, as this is in a manufacturing district where much more demand is made for power than in the first district, in which the number of motors is being rapidly increased.

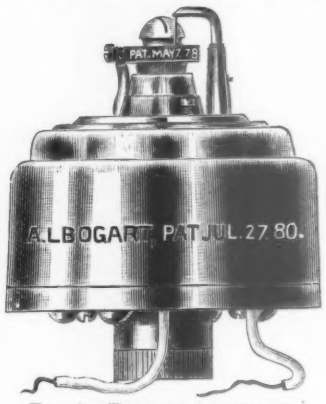


Fig. 4.—Tirrell Automatic.

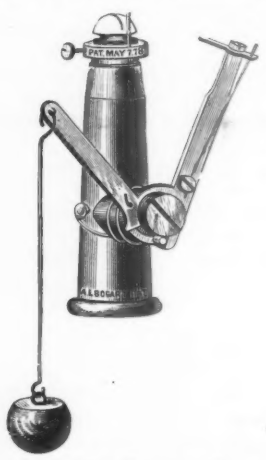


Fig. 1.—Plain Pendant Burner.

The underground system is three-fourths completed, and a small section of it already connected to the station; and the balance will be started upon at once. Upon the completion of this the lights upon the present overhead system will be transferred to the underground, and the overhead system eventually taken down.

The four dynamos and six engines are all set in place; and, within the next week, eight other 400 ampere machines will also be set up. The ultimate capacity of this station is to be twenty 15½x15 Armington & Sims engines, and 40 No. 20 dynamos, which will give an ultimate capacity to the station of 40,000 Edison lamps.

Electric Gas-Lighting Burners.

In point of convenience no branch of electrical work is more appreciated than that of electric gas lighting burners and apparatus. We all have experienced the annoyance and aggravation of hunting around in the dark for a match, and when found, stumbled over chairs and tables to the burner, before a permanent light could be secured. When there is added to this the fact that at critical moments the match-safe often proved to be empty, it is not difficult to realize the many and various annoyances that were constantly to be met with. But now there is a change. Electricity has again furnished the means for making this change, and one of the earliest workers—away back in 1853—in this field was Mr. A. L. Bogart, of 22 Union Square, New York, whose name is most widely known in connection with the numerous improvements that have from time to time been made since first the idea was practically developed. In Mr. Bogart's establishment on Union Square are to be seen not only all the styles and improvements in electric gas-lighting apparatus, but numerous complete and efficient combinations to prevent burglaries and house-breaking have been perfected, by which the opening of a door, etc., will not only ring an alarm, but will also light any number of gas jets desired, bringing the burglar face to face with his greatest enemy, that of light.

Fig. 3.—Bartholdi Automatic.

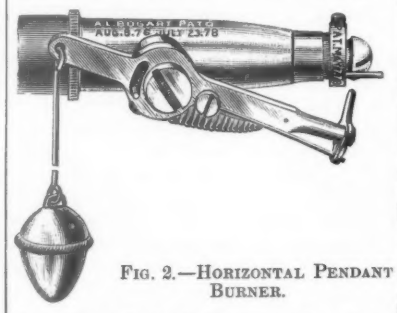


Fig. 2.—Horizontal Pendant Burner.

The most satisfactory achievement reached by Mr. Bogart is the perfection attained, electrically and mechanically, in his Bartholdi automatic burner, which we illustrate. Its use for halls, cellars, bed-rooms, etc., is constantly increasing, and its construction is such that it is impossible to have the gas escape after the light has been extinguished. This automatic burner is very neat and compact, and is in every way apparently a perfect appliance. Other kinds and styles are illustrated, such as the pendant, the ratchet and the imitation candle, all of which are manufactured under patents owned by Mr. Bogart.

In the cut-offs, which are shown, a simple and easy method has been devised for quickly and easily locating trouble, should any occur; and, instead of having to examine all the burners and points of probable danger, the section or floor is located, and all other departments assume their usual functions undisturbed. This has proven a great convenience where large buildings have been fitted up with these improvements.

The students of the Sibley College, of Cornel University, have commenced the publication of a monthly, named *The Crank*. It is intended to represent the interests of the mechanical and electrical engineers, and the first issue, in March, was a very creditable number.

PERSONAL NOTES.

Mr. J. F. Morrison, of Baltimore, and Mr. A. J. DeCamp, of Philadelphia, were New York visitors the past week. Both gentlemen expressed themselves pleased with the outlook for electric lighting this year.

Mr. Herbert N. Fenner, of Providence, the manufacturer of braiding machinery, used by all manufacturers of covered wire, has been nominated on the Republican ticket for Representative in the Rhode Island Legislature. He should be elected by a large majority.

Mr. Gardiner Sims, the handsome engine manufacturer, will soon be married to Miss Laura Brayton, of Providence, the youngest daughter of the late Lodowick Brayton. The groom will be warmly congratulated by his married friends—and the forsaken bachelor fraternity, of which he was a shining member, will mourn his departure.

There is much public interest taken in the work of Mr. Stephen D. Field on his electric motor at Yonkers, N. Y. Mr. Field is an earnest and well-informed electrician, not given to any clap-trap methods or schemes, and is deserving of a great deal of praise for the numerous ingenious electrical appliances he has brought out in the past. It is very likely, however, that his motor system will eclipse all former work.

Mr. C. J. H. Woodbury, second vice-president of the Boston Manufacturers' Mutual Fire Insurance Company, was a New York visitor last week. It was not very long since, in a case where Mr. Woodbury was called to give expert scientific testimony, that his definition of a certain force in hydro-dynamics was found to be different from the popular one in a standard dictionary. The judge naturally felt disposed to side with the dictionary, until Mr. Woodbury had brought into court standard scientific works in English, French and German languages and proved conclusively that he was correct. Still, the able young scientist admits that for a moment he felt that he appeared to a disadvantage.

One of the most thoroughly well occupied members of the telegraphic fraternity, is Mr. Chas. Selden, of Baltimore. His responsible duties as superintendent of the entire telegraph system of the B. & O. Ry. Co., general superintendent of the B. & O. Telegraph Company, and expert electrician to pass on all electrical schemes submitted to the railway company, would seem work enough for one man, but was not sufficient to interfere with his invention of the sextuple telegraph, nor with his taking a leading part in working out a new telephone. Just now he is engaged with Belgian electricians on important electrical work. Mr. Selden is an old friend of Edison and Gilliland, and these three comprise a trinity of electrical information unexcelled in practical application—strong representatives of the telegraph, electric light and telephone.

A Bridgeport electrical man, after his day labors among wire consumers, occasionally visits the theater in the evening. In Providence he found his view of the stage shut off by a large six footer immediately in front, who apparently appreciated the situation and continually kept moving his head, to more effectually frustrate all attempts of the Bridgeporter to follow the play. An intense longing for revenge crept into the heart of the victim. The six footer's silk hat was evidently beneath his chair; and sudden sight of it brought a gleamful glitter into the Bridgeporter's eyes. He first gently rubbed the gloss the wrong way with the toe of his boot, and then, as his view was again shut off, his indignation overcame him, and he ground his heels into the hat, he crushed it mercilessly, gloated over its battered appearance, and chuckled and enjoyed himself. The play, he discovered, was soon to end, and he thought it wise to leave early. He reached for his hat. "I could swear I put it under this seat—where is it? Under the next one? No. Where the d——" Oh, horrors! It was his own hat he had ruined. * * * * The first customer to greet an adjoining hat store the next morning was he gentleman from Bridgeport.

Electricity on the Suez Canal.

According to a recent bulletin issued by the Suez Canal Company, vessels are now allowed to pass the canal at night under the same regulations as have hitherto been in force for the day passage, provided they are supplied with an electric projector, placed in front of the vessel as near as possible to the surface of the water, and able to illuminate the canal for a distance of 1200 m. in front, and with an electric lamp and shade suspended above the bridge, illuminating a circle of about 100 m. radius. No special type of apparatus is prescribed, but the officials of the company will judge in each case whether the engine, dynamo, lamps, and all the fittings can be fairly considered to comply with the requirements of the company.

The Ide Engine in Demand.

The Foundry and Machine Department of Harrisburg, Pa., have just shipped the following Ide Automatic Engines: One 400 horse power engine to the Union Lime and Cement Co, Louisville, Ky.; one 40 horse power engine to the American Tube & Iron Co., of Middletown, Pa; one 80 horse power to Brandt & Manning of Mount Joy, Pa.; one 50 horse power to Armstrong & Co. of Lock Haven, Pa; one 25 horse power to Seyfert & Co, of Reading, Pa.; one 25 horse power, to C.B. Brelsford & Co., of Harrisburg, Pa., also boiler to the same party; one 25 horse power engine and boiler to T. N. Hostetter, of Florin, Pa.; one 25 horse power engine to C. & H. Russel, of Pen Yan, N. Y.; one 50 horse power engine to the McHose Fire Brick Works of Reading, Pa. They also shipped last week to the United States Electric Light Co., at Washington City, five 100 horse power steel return tubular boilers, and will ship the coming week one 100 horse power Ide engine to Green & Wood of New Bedford, Mass., also two 70 horse power engines and steel return tubular boilers and complete power plant to the Excelsior Electric Eight Co., of Harrisburg. Boilers furnished in connection with engines have all been set with the Whitmeyer patent dirt burning furnace, also three 50 horse power locomotive fire-box boilers for the Pulaski Iron Co., of Virginia. The City Water Works boilers of Harrisburg have also been provided with the Whitmeyer patent furnace.

—— Wm. S. Frear, secretary of the Brush Electric Light Company of Buffalo, writes to the *Courier* of that city, that his company stands ready, and have so stood, to adopt any feasible or practical mode or method for putting their wires underground. Time and money have been spent by them experimenting and investigating in this matter, and if a conduit can be constructed in which electric light wires can be operated it will be adopted without delay. It is the hope of the board that the device controlled by the Associated Conduit Company will answer the purpose. A petition is now awaiting the action of the common council to lay underground conduits, and when permission is granted, experimental sections will be built at the earliest possible moment.

—— The electric light interest opens very active for this year. The Westinghouse Machine Company has made recent shipments to electric light companies as follows: South Side Electric Light Company, Pittsburgh, Pa., two 150 horse power; Brush Electric Light Company, Buffalo, two of 60 horse power (twenty-first order). The East End Electric Light Company, Pittsburgh, Pa., two 75 horse power (third); Hartford Light and Power Company, Hartford, Conn., two 60 horse power; Jefferson City Electric Light Company, Jefferson City, Mo., 60 horse power; The Portland Electric Light Company, Portland, Oregon, four of 60 horse power, (seventh); Litchfield Electric Light Company, Litchfield, Ill., 100 horse power; Cleveland Electric Light Company, Cleveland, Ohio, 75 horse power, (seventh); Canon City Electric Light Company, Canon City, Col., 60 horse power; Olney Edison Electric Light Company, Olney, Ill., 60 horse power; Jenney Electric Light Company, Fort Wayne, Ind., three of 15 horse power.

The Eickemeyer Dynamo.

A recent test at Yonkers, N. Y., of the new Eickemeyer dynamo, gives the following electrical output:

Size of armature....8 in. diameter by 4½ in.
Speed of armature.....1,200 revo. per min.
E.M.F.....200 volts } Watts, 6,000.
Amperes..... ..... 30 }

Had the machine been so located that more power could have been secured, it was predicted that the armature would have given a current of 300 volts.

—— The lighting at the central station at Milan, Italy, is effected by means of the transformers of Zipernowski, Deri, and Blathy. The generating machine is of the type S W_6 of Ganz & Co., with 20 magnets, and giving, therefore, at a speed of 250 revolutions, 5,000 alternations per minute. The current for which the machine was built is 55 amperes at an E.M.F. of 1,300 volts, but for the present only 22 amperes are required. The exciting current is 30 amperes and 100 volts, and is furnished by part of the current of the machine being converted into a continuous current by means of a commutator. Both the main current and the exciting current pass through a "compensator," by the action of which the E.M.F. at the terminals of the transformers is kept constant. The main current is conveyed from the central station to the Theater Dal Verme by means of a concentric cable, the distance being 1,260 yards. In the theater there are at present three transformers of 10 horse power each, by which the E.M.F. is reduced to 96 volts.

Fig. 4.—Imitation Candle. Pendant Burner.

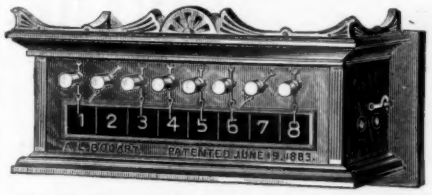


Fig. 7.—Sectional Annunciator Cut-off.

* * A practical demonstration of electricity as a motive power may now be seen at the office of the *Cincinnati Artisan*. At present, however, they are using a motor kindly furnished by the Brush Electric Company, of that city, which will be exchanged in a short time for a Silvey motor which is being built for the special requirements of this establishment.

—— The new government launch, "Lucerne," lately built for the engineer's department under the designs of Mr. Gielow, and engined by 10x10 Westinghouse engine, has just made her trial trip very successfully, making about 13½ knots an hour.

—— The Birmingham, Conn., Electric Light Works were overrun with rats until the superintendent had a happy thought. To wires attached to dynamos he fastened bits of meat and scattered them about. The rats smelled the meat, nibbled, and—good-by, rats.

Fig. 8.—Gas Lighting Attachment for Burglar Alarms.—Exterior View.

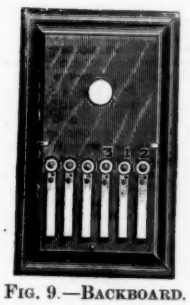


Fig. 9.—Backboard.

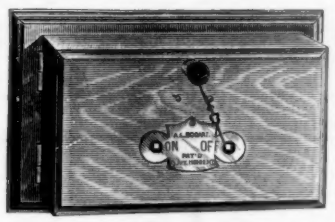


Fig. 5.—Exterior View of Main Line Cut-off.

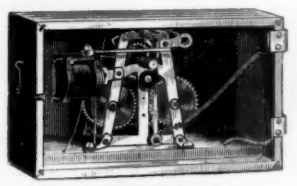


Fig. 6.—Interior View.

—— A stock company has been formed to erect an electric light plant at Portsmouth, Va.

—— The use of electric lights in theaters has driven paper snow largely off the stage. Various substitutes have been tried in Paris, and the very best imitation of snow has been found to be the scraps and clippings of kid left over from cutting out gloves. They float in the air, descending with very realistic slowness, and they cling visibly to the garments of the actors. These clippings are furnished by several of the leading glove houses of Paris, and cost $3 a sack.

—— The electric light seems destined to play a part in the future in connection with colliery works, and if, by so doing, any proportion of the explosions can be avoided and lives saved, the promoters of this particular application may be congratulated. The Gulcher Electric Light and Power Company have recently erected an installation of sixty-five 16 candle power Swan lamps at the Standard Colliery, Yorkshire. Thirty of these lamps are for underground use. The cable ends at the bottom of the pit in a slate terminal box, carrying positive and negative terminal bars. Three circuits of $\frac{7}{18}$ inch insulated cable go thence to the underground lamps.

ELECTRIC LIGHT NEWS

—— The Mather Electric Light Company is to be exempted from taxation by the city of Hartford for five years.

—— On the 12th of March a 50 light plant of the American system of electric lighting was installed at Seattle, W. T., for the gas company, by Mr. F. W. Pope-Cox. The Thomson-Houston and Edison lights are also running in Seattle.

—— Mrs. Hicks-Lord, whose residence was recently burglarized, sent to the Aldermen of New York city a petition for an electric light near her residence in West Washington place. She proposes to have a little more light on the next burglar who makes free with her silver plate.

—— M. Eiffel lays great stress on the importance of the Eiffel tower for illumination purposes, and says that if fitted with a number of powerful electric lamps it might light the whole Paris Exhibition. The arrangements with regard to the lighting, in which the town will have a say, are not yet definitely fixed.

—— The Clark dynamo, owned by the Clark Electric Company, of which Mr. J. H. Seymour, of 159 Chambers street, is the head, can be seen operating twenty Brush arc lamps at 508 West 14th street, from 3 to 5 P. M. The lamps give a steady light. Mr. Clark is at work on an arc lamp of his own to go with his dynamo, which was illustrated in the Review several weeks ago.

—— The employes of the Citizens' Electric Illuminating Company, of Brooklyn, give an illumination ball and reception at the Palace Skating Rink, Clermont avenue, Monday evening, April 11. Tickets are 50 cents each, and the proceeds are announced for a relief fund. The many well-pleased customers of this lighting company will no doubt largely patronize this entertainment given by the employes.

—— The San Francisco street light committee has refused a large number of requests for additional electric lamps, owing to insufficient appropriation, stating that the only time that consideration can be paid to them and other petitions of a similar character is in the month of June, the time when the levy is being fixed. If the board should then be in favor of making an additional levy for lighting streets, then additional lamps and electric lights can be erected.

—— The Edison Machine Works, recently started at Schenectady, is now employing between 600 and 700 men, and has just started some of the departments on night and day runs. The capacity of the works is 2,000 dynamos a year and about 700 miles of Edison underground conductors. The capacity for the manufacture of the latter is to be tripled during the next three months. The officers of the works are: Thomas A. Edison, president; Chas. Batchelor, vice-president and general manager; Samuel Insull, secretary and treasurer; John Kruesi, assistant general manager.

—— There is now before the public a large variety of electric systems for various purposes bidding for public favor.

Some of these will without doubt flourish and live. Some are like Pindar's razors—"made to sell." As the reporter said of two ministers who made diametrically opposite statements in a particular case, "one of them told the truth."

Looking back a couple of years it is easy to recall several electric light snaps which in many respects resemble the other minister. There are some now on the market which will be like one of those ministers before long, and the hope and prayer of all honest electric light men is that the experience which is to settle their fate for good or evil, may not prove too expensive in losses of life or property. The public cannot afford to do gratuitous experimenting for inventors.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MARCH 22, 1887.

359,053 Electric gas lighting apparatus; Charles B. Bosworth, Everett, Mass., assignor to the Electric Gas Lighting Company, Portland, Me.

359,055 Galvanic battery; Horatio J. Brewer, New York, N. Y.

359,063 Galvanic battery; Lucien A. W. Desruelles, Paris, France.

359,067 Electric switch register; Charles Fearon, Philadelphia, Pa.

359,072 Secondary battery; William W. Griscom, Philadelphia, Pa., assignor to the Electrical Accumulator Company.

359,085 Electro-magnetic ore separator; George W. Mansfield, Jersey City, N. J.

359,101 Electric regulator; Oliver B. Shallenberger, Rochester, Pa.

359,188 Telephone transmitter; Joseph H. Tabony, New Orleans, La., assignor of two-thirds to Charles E. Black and Atwood Violett, both of same place.

359,205 Armature and process of and apparatus for forming the same; Chas. G. Curtis, Schuyler S. Wheeler and Francis B. Crocker, New York, N. Y., assignors to the C. and C. Electric Motor Company.

359,210 Electro-magnetic transmitting and disturbing thermoscope; Henry I. Haight, New York, N. Y.

359,221 Electric arc lamp; Henry C. McDill and James E. Gaston, Fort Worth, Tex., assignors of three-fifths to Joseph H. Brown, William G. Newby and William H. McDill, all of same place.

359,593 Automatic electric air-brake; J. Fairfield Carpenter, Berlin, Germany.

359,607 Electric railway; Isaac W. Heysinger, Philadelphia, Pa.

359,619 Combined volt and ampere meter; Roderick Macrae, Baltimore, Md.

359,622 Mode of setting telegraph poles; Wm. Murray, Minneapolis, Minn.

359,673 Apparatus for controlling low pressures; Milton W. Grovesteen, New York, N. Y.

359,686 Municipal signal apparatus; Bernice J. Noyes, Boston, Mass., assignor to the Municipal Signal Company, Portsmouth, N. H.

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359,688 Municipal signal apparatus; Bernice J. Noyes, Boston, Mass., assignor to the Municipal Signal Company, Portsmouth, N. H.

359,689 Individual call for municipal telegraph systems; Bernice J. Noyes, Boston, Mass., assignor to the Municipal Signal Company, Portsmouth, N. H.

359,713 Electric lighting system: Frederick A. Cheney, Troy, N. Y.

359,726 Electrical conductor; Edward A. Johnson, New York, N. Y.

359,738 Underground conduit for powerful electric currents; George B. Pennock, Brooklyn, N. Y.

359,739 Regulator for electric circuits; Joseph A. Powers, Troy, N. Y.

359,747 Toll-collecting apparatus for public telephone stations; Joseph H. Tabony, New Orleans, La., assignor of one-half to Atwood Violett, same place.

359,748 Dynamo-electric machine; Nikola Tesla, Smiljan Lika, Austria-Hungary, assignor to the Tesla Electric Light and Manufacturing Company, Rahway, N. J.

359,770 Regulator for dynamo-electric machines; Charles L. Buckingham, New York, N. Y.

359,794 Reflector for lamps; Julius Levy, San Francisco, Cal.

359,805 Electrical synchronal escapement; Jas. F. McLaughlin, Philadelphia, Pa.

359,812 Insulator for supporting and holding electric wires; Henry Pennie, Brooklyn, N. Y., assignor of one-half to Louis C. Schleip, same place.

359,816 Terminal for telegraph lines or cables; Wm. H. Sawyer, Providence, R. I.

359,824 Electric circuit for telephones and fire and burglar alarms; Siefried Taussig, Prague, Bohemia, Austria-Hungary.

359,825 Insulating material; Colin M. Thompson, Brooklyn, N. Y.

359,835 Battery zinc; John Beattie, Jr., Westport, Mass.

359,866 Cellular furnace for baking carbons; James Hill, Cleveland, Ohio.

359,876 Process of preparing secondary battery plates; and 359,877, Secondary battery; Abraham V. Meserole, New York, N. Y., assignor to the River and Rail Electric Light Company, of West Virginia.

359,894 Dynamo-electric machine; Robert J. Sheehy, N. Y.

359,900 Charging and discharging secondary batteries; and 359,901, Mechanism for charging secondary batteries; Eli T. Starr, Philadelphia, Pa., assignor, by mesne assignments, to the Electrical Accumulator Company, of New York.

359,902 Aerial photographic apparatus; Mathew J. Steffens, Chicago, Ill.

359,916 Electric lamp frame; Thomas H. Brady, New Britain, Ct.

359,934 Secondary battery; William Main, Brooklyn, assignor to the River and Rail Electric Light Company, of West Virginia.

359,984 Telephone signal; Charles R. Swain, Peekskill, N. Y., assignor of one-half to William D. Southard, same place.

RE-ISSUES.

10,816 Oiler and wiper for commutators; Jaco, Snowberger, Akron, Ohio, assignor of three-fourthb to U. Grant Kirn, Louis A. Smith and Orlando Cases all of same place.

PAINE & LADD,

HALBERT E. PAINE, Late Commissioner of Patents. | STORY B. LADD.

Attorneys in Patent Causes And Solicitors of Patents.

WASHINGTON, D. C.

BUSINESS ANNOUNCEMENT.

We beg to announce that we have opened a supply house at 38 and 40 La Salle Street, Chicago, where we shall keep constantly on hand a full line of Electrical Supplies of every description, and with low prices, courteous treatment, and prompt attention to orders, we hope to merit your patronage, and respectfully solicit the same.

Very respectfully,
CENTRAL ELECTRIC CO.

BUSINESS NOTICE.

INCANDESCENT LAMP FOR SALE.—All the process for making 125 to 128 volt Incandescent Lamp, using half an ampere of current (or less); life tested full 600 hours average, and will stand shipping as well as a 50 volt lamp. Party will make them in connection with some good company, or sell the whole process for 50 volts to 150 volts. The lamp has a high efficiency—not at expense of life; 20 to 25 per cent. higher candle power per horse power than any 120 to 130 volt lamp in market; high volt.

Address "C. P.," P. O. Box 3329, N. Y.

BUSINESS NOTICE.

The discussions at the sessions of the National Electric Light Association developed a deep interest in the question of insulation—what is the best insulated wire? The universal opinion seems to be that the so-called "Underwriters'" wire is practically non-insulated. Most of the really insulated wires possess certain virtues in a high degree, while their infirmity is that they lack in a great degree other qualities essential to a good practical wire. A wire to commend itself to electric light companies, should have the following qualities:

1. A proper insulative resistance. 2. Toughness, so that bending, twisting and rubbing will not break or impair the insulation. 3. Freedom from capillary attraction through contact with humid air or moist surfaces. 4. Adhesion of insulation to the wire, so that abrasion and violence will not disturb it. 5. Immunity from noissome vapors and gases from sewers and water closets, and from sal ammoniac and ammoniac gases arising from decaying matter. 6. Good finish and cheapness. 7. The insulation should be sufficiently water-proof to resist the action of protracted storms. 8. It should not be affected by climatic changes. 9. It should not oxidize or be affected by the action of the air.

It has come to be generally understood that while rubber and gutta-percha are, when new, superior insulators, yet as when exposed to the air, they become so oxidized in from twelve to twenty-four months as to be useless, they are impracticable. Paraffine and all natural waxes, gum combinations and equivalents, are fair insulators, but a single night of dog-day weather has totally ruined them through capillary attraction. Shellac and its combinations have good resistance but are brittle and short lived. Natural asphalt does not oxidize, and its combinations are doubtless helped by the presence of the asphalt; but it is full of pin-holes, is prone to capillary attraction, and is brittle in cold and sticky in warm weather.

It is asserted by those who have for from one to three years used the "Campbell" insulated wires, that they possess, in eminent degrees, the nine essential qualities above named. The Simplex Electrical Company, of 328 Washington Street, Boston, and 145 Broadway, New York, are sole agents for the "Campbell," and they invite correspondence with users of insulated wires.

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"In making the statements which follow we can verify each and all of them as facts. Mr. Edward P. Thompson, of Temple Court [7 Beekman St.,] New York, is a good man to bring your patent cases to, for he is thoroughly versed in all the ins and outs of a Patent Attorney's duties. The following are some of his qualifications: Graduate of Stevens Institute as Mechanical Engineer. For four years tutor of classes of young men in mathematics and experimental physics at Elizabeth, N. J. Served professionally as Electrician and Chemist in the Swan Electric Company of New York for two years. Because of past successes as a Patent Attorney at 13 Park Row, New York, was appointed, to succeed N. S. Keith, of the patent agency of the *Electrical World* and Associate Editor. N. S. Keith is known as the Translator and Reviser of Schellen's Treatise on "Dynamo Electric Machinery." Mr. Thompson for two years personally prepared and prosecuted all the patent business of *Electrical World's* Patent Agency, and is the author of a series of articles in said paper upon "Analytical and Systematic Method of Inventing," which were widely known and favorably received. Mr. Thompson is a member of American Institute of Electrical Engineers and American Society of Mechanical Engineers. He is author of the "Expansion of Polynomials," which the ablest mathematicians of the world universally commend."
—*New York Observer.*

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